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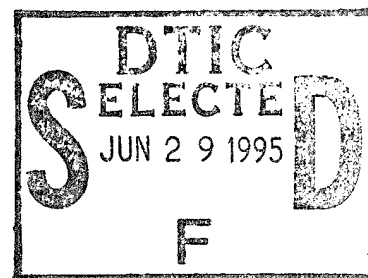
**FINAL**

**PHASE I  
SUPPLEMENTAL SITE INVESTIGATION  
OPERATIONS PLAN**

**WOODBRIE RESEARCH FACILITY, VIRGINIA**

**Prepared By:**

**EARTH TECH**  
1420 King Street, Suite 600  
Alexandria, Virginia 22314



**Prepared For:**

**U.S. Army Environmental Center**  
Aberdeen Proving Ground, Maryland 21010

**May 1995**

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Modification 2

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## LIST OF ACRONYMS & ABBREVIATIONS

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AREE	Area Requiring Environmental Evaluation
ARL	Army Research Laboratory
BCT	BRAC Cleanup Team
bgs	Below Ground Surface
BNA	Base/Neutral Acid
BRAC	Base Realignment and Closure
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAC	Commonwealth Agency Coordinator
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOD	Department of Defense
DQO	Data Quality Objective
DSMOA	DOD and State Memorandum of Agreement
EARTH TECH	The Earth Technology Corporation
EMI	Electromagnetic Induction
ENPA	Enhanced Preliminary Assessment
gpd	Gallons per day
GPR	Ground Penetrating Radar
IRDMIS	Installation Restoration Data Management Information System
IRP	Installation Restoration Program
MEK	Methyl Ethyl Ketone
mg/L	Milligrams per liter
NEPA	National Environmental Policy Act of 1969
PCB	Polychlorinated Biphenyl
PIRP	Public Involvement and Response Plan
PO	Project Officer
POC	Point-of-Contact
ppm	Parts per million
QA/QC	Quality Assurance/Quality Control
SAP	Sampling and Analysis Plan
SCR	Site Characterization Report
SI	Site Inspection
SSI	Supplemental Site Inspection
SVOC	Semivolatile Organic Compound
TPH	Total Petroleum Hydrocarbon
TSAP	Technical Sampling and Analysis Plan
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VADEQ	Virginia Department of Environmental Quality
VDWM	Virginia Department of Waste Management
VOC	Volatile Organic Compound
WRF	Woodbridge Research Facility

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# SECTION 1.0

## INTRODUCTION

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In 1990 the Defense Base Closure and Realignment Act established the formal process to identify those Department of Defense (DOD) facilities which are suitable candidates for realignment. The 1990 Base Closure Act serves to accommodate the reduction in DOD forces by identifying which activities may be relocated and which DOD installations may be permanently closed, eventually allowing real property transfer at the closed installations according to environmental requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In July 1991 the Army Research Laboratory, Woodbridge Research Facility (WRF), Woodbridge, Virginia, was recommended for closure by 1991 Base Realignment and Closure (BRAC 91). As per BRAC 91, the U.S. Army closed WRF on 16 September 1994 and plans to dispose of the property before the 1 October 1997 deadline.

The U.S. Army Environmental Center (USAEC), Aberdeen Proving Ground, Maryland, directed The Earth Technology Corporation (EARTH TECH) to complete a Supplemental Site Inspection (SSI) of the WRF installation. This SSI is being conducted as part of the U.S. Army Installation Restoration Program (IRP) with all specific activities and project responsibilities as defined in contract number DAAA15-91-D-0009, Delivery Order 0001. Project-specific administration and technical supervision of this delivery order are provided by USAEC-Base Closure Division.

A Final Work Plan for the Site Investigation at WRF was prepared in March 1994. During the field investigations, the BRAC Cleanup Team (BCT) requested several changes to the sampling effort. The Phase I SSI/Virginia Department of Environmental Quality (VADEQ) Operations Plan documents the requested changes.

This document, entitled "Phase I SSI Operations Plan, Woodbridge Research Facility", describes all tasks to be performed in order to fully characterize and evaluate several potentially contaminated sites at the WRF installation. This Operations Plan is prepared, and all activities specified herein, are to be completed in accordance with the National Environmental Policy Act of 1969 (NEPA) and Army Regulation 200-2.

As part of the IRP process, an Enhanced Preliminary Assessment (ENPA) was performed to document past activities and existing conditions at WRF. The objectives of the ENPA included identifying and characterizing all Areas Requiring Environmental Evaluation (AREEs) that may require a SI or immediate remedial action, and other actions that may be necessary to address and resolve all identified environmental problems. The ENPA, delivered in March 1992, identified 29 AREEs and provided recommendations for appropriate actions.



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Twenty-two of the 29 AREEs included in the ENPA were identified as requiring further investigation. These 22 AREEs were sampled between 8 September and 8 October 1993 in a Preliminary SI. The intent of the Preliminary SI was to determine what if any contamination existed at the 22 AREEs. The results of this investigation are discussed in the SI Report (Earth Tech, 1995).

After reviewing the preliminary findings, the BCT recommended that SSI sampling be done at eight AREEs. The AREEs are listed in Table 1-1 (AREEs Requiring a Phase I SSI) and shown on Figures 1-1 and 1-2.

In addition to the SSI, WRF was directed by the VADEQ to complete a site characterization for Building 202 to comply with the Virginia Underground Storage Tank Regulations (Table 1-2). This investigation is also discussed in this plan.

The proposed sampling outlined in this Operations Plan will be performed in accordance with the Technical Sampling and Analysis Plan (SAP) (EARTH TECH, February 1995). The analytical program which will complement the field investigation is defined in the Quality Assurance/Quality Control Plan (QA/QC Plan), (EARTH TECH, March 1995).

**TABLE 1-1**  
**AREEs REQUIRING A PHASE I SUPPLEMENTAL SITE INSPECTION**

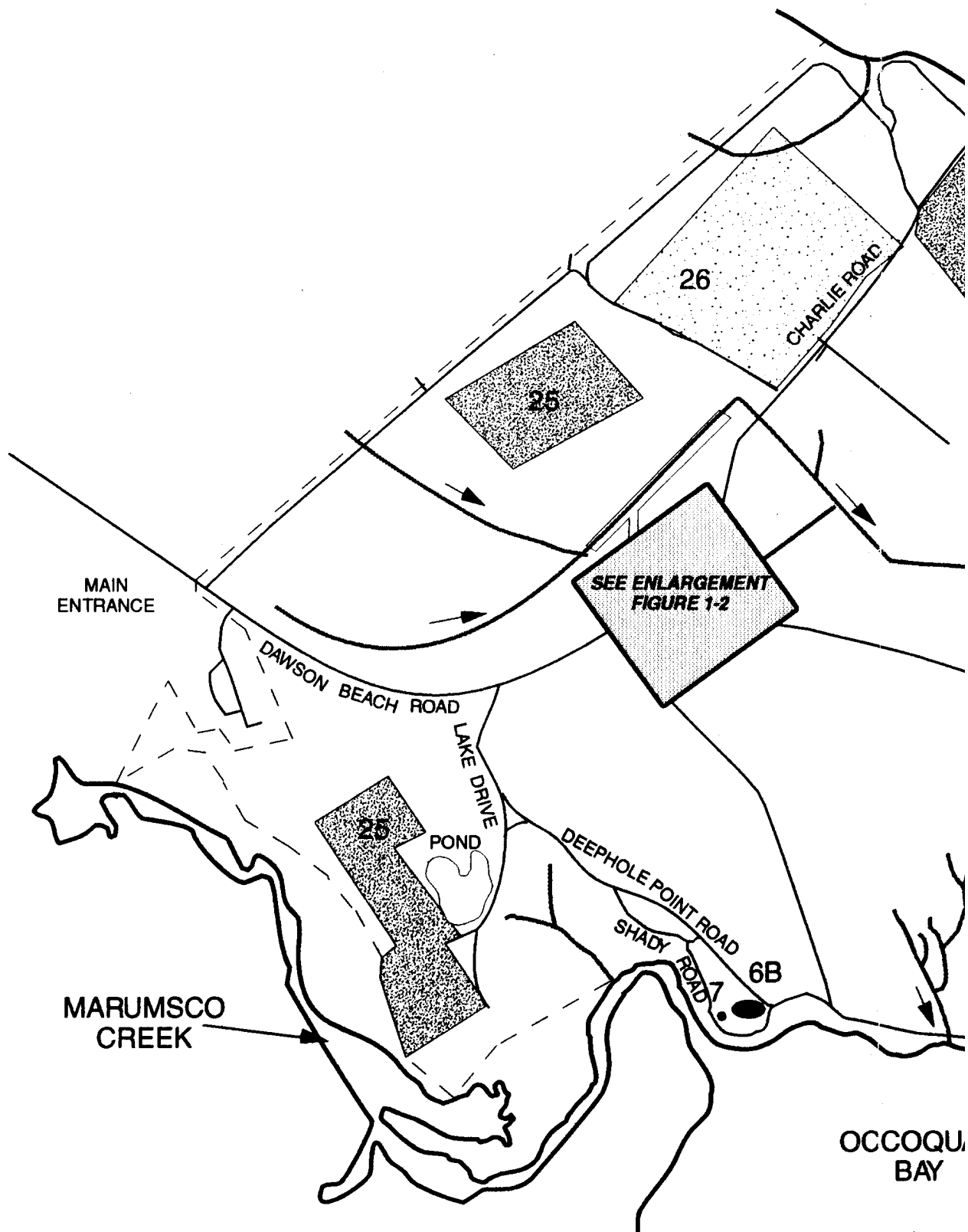
AREE No.	Description and Enhanced Preliminary Assessment Summary of Findings	Preliminary Site Inspection and Other Summary of Findings	Media to be Sampled
6B	<b>Former Dump:</b> Aerial photos indicate soil disturbance in 1960s and 1970s.	No debris was encountered in excavated trenches. No PCBs or VOCs were detected in groundwater samples collected using direct push points.	Soil
7	<b>Pistol Range:</b> Rounds fired into soil bank. Covered with soil in 1982.	No bullets were encountered. One soil sample was collected. Concentrations of beryllium, cobalt, copper, nickel, and zinc slightly exceeded the values reported for background and USGS regional soil data.	Soil
12	<b>Drum Storage Area:</b> Waste drums stored on pavement north of maintenance shop containing waste oil, paints, cleaning solvents, antifreeze, brake fluid are sent to Adelphi periodically for disposal.	VOCs and TPH were detected in two composite samples collected from under the pavement. Four areas of pavement were excavated.	Soil
13	<b>Acid Neutralization Tank:</b> Tank is connected to drain in battery storage room in Building 211	The tank appeared in good condition. The soil pH tested 6.4 in the field. The collected soil sample had a pH of 7.0.	Soil Aqueous
18	<b>Flammable/Battery Storage (Building 204):</b> Storage building for drums and batteries. Has concrete floor. Current battery storage area has safety shower and drain.	Located and sampled drain outfall. Four soil samples were collected. The AREE 18 manganese range slightly exceeded background and regional USGS ranges. Toluene was detected in a soil sample.	Joint-material
21	<b>Former Storage Area:</b> Site partially covered by present Building 211. Reportedly stored transformers and capacitors in early 1970s.	TPH were detected in four composite surface soil samples. No PCBs were detected.	Soil
25	<b>Sewage Injection Area:</b> Sewage sludge injected into ground at depth of 2 feet in 1974.	Six surface soil samples were collected. The AREE 25 cobalt range slightly exceeded background and regional USGS ranges.	Soil
26	<b>Buried Antifreeze in Hoses:</b> Ethylene glycol in rubber pipes in ground.	No hoses were encountered in nine excavated trenches.	Soil Aqueous

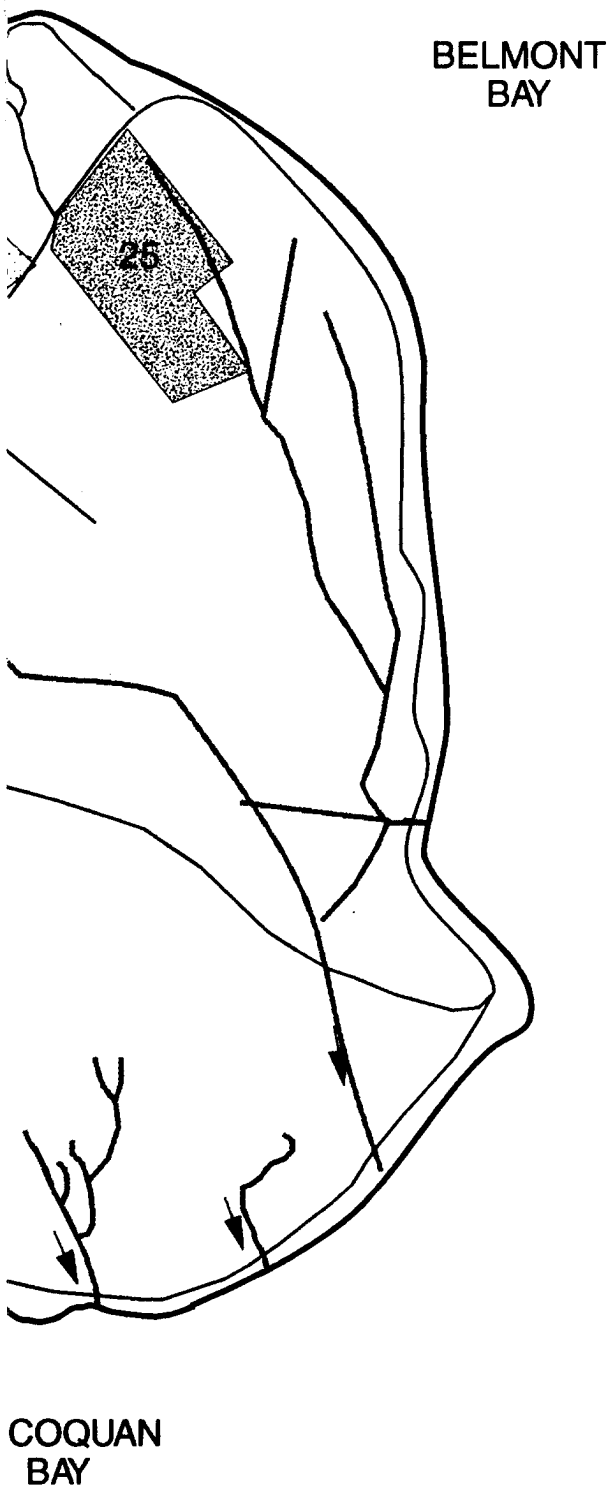
Key: PCB = Polychlorinated Biphenyl  
 TPH = Total Petroleum Hydrocarbon  
 VOC = Volatile Organic Compound  
 AREE = Area Requiring Environmental Evaluation  
 USGS = U.S. Geological Survey  
 VEPCO = Virginia Electrical Power Company  
 BRAC = Base Realignment and Closure

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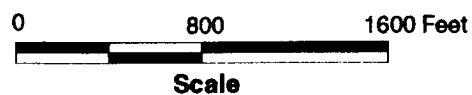


## KEY

- Facility Boundary
- Road
- Drainage and Flow Direction
- 6A AREE Number
- AREE 25
- AREE 26

## AREE NUMBERS

- 6B. Open Dump
- 7. Pistol Range
- 25. Sewage Injection Areas
- 26. Buried Antifreeze Pipes (approximate location)



EARTH SYSTEM

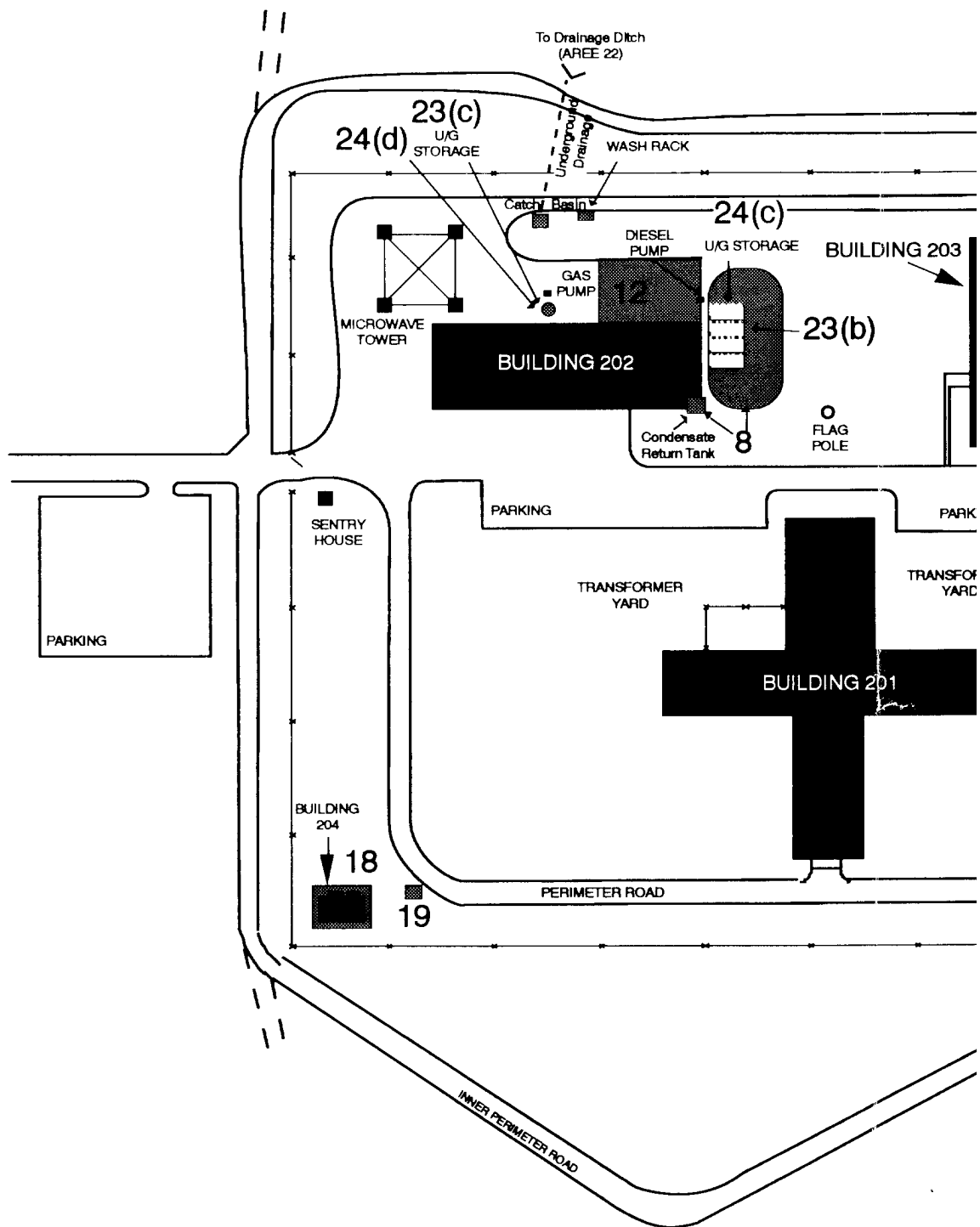
FIGURE 1-1

**Woodbridge Research Facility Areas  
Requiring Environmental Evaluation  
Included in Phase I SSI**

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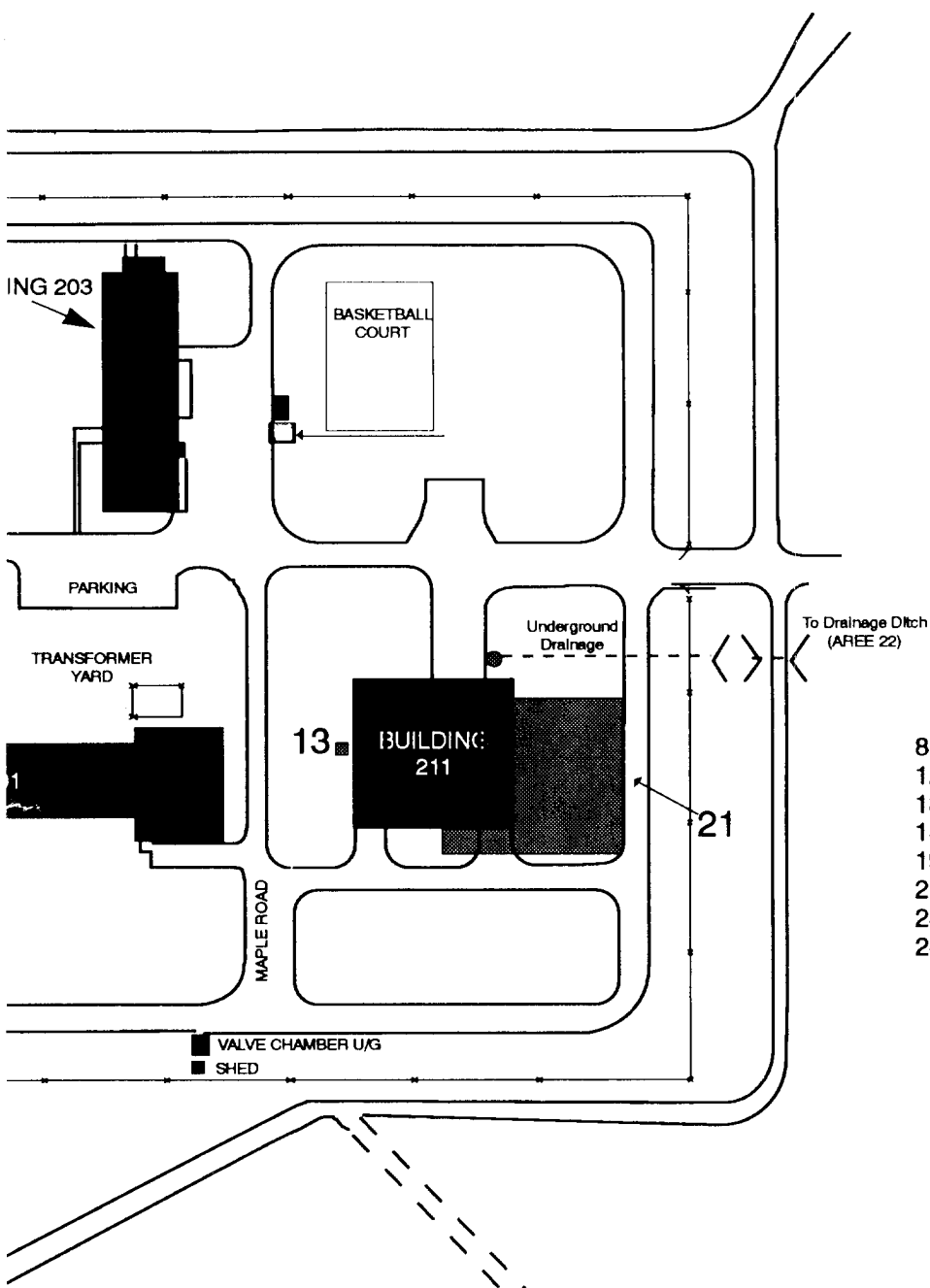


# KEY

- Fence
- 6A AREE Number
- AREE
- >< Outfall

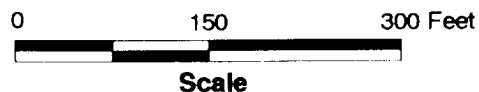
Former USTs (AREE 23)  
 (b) Three former 10,000-gallon USTs.  
 (c) One former 1,000-gallon UST.

Existing USTs (AREE 24)  
 (c) One existing 2,000-gallon UST.  
 (d) One existing 1,000-gallon UST.



#### AREE NUMBERS

- 8. UST Leaks and Spills
- 12. Drum Storage Area
- 13. Acid Neutralization Tank
- 18. Flammable Storage
- 19. Thermal Battery Storage
- 21. Former Storage Area
- 23. Former Underground Storage Tanks
- 24. Existing Underground Storage Tanks



EARTH TECH

FIGURE 1-2

**Woodbridge Research Facility  
Areas Requiring Environmental  
Evaluation  
MAIN COMPOUND MAP**

NOTE: SEE FIGURE 1-1 FOR AREAS REQUIRING ENVIRONMENTAL EVALUATION OUTSIDE OF MAIN COMPOUND



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**TABLE 1-2**  
**AREES REQUIRING A VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**RESPONSE ACTION**

AREE No.	Description and Enhanced Preliminary Assessment Summary of Findings	Preliminary Site Inspection and Other Summary of Findings	Media to be Sampled
8	<b>UST Leaks and Spills:</b> Area contained three 10,000-gallon USTs which were removed after leaking. Several major spills during UST filling and oil transfers.	TPH were detected in two composite surface soil samples. TPH were detected in the condensate return pit.	Soil Groundwater Aqueous
23	<b>Former USTs at Building 202:</b> Four USTs have been removed from Building 202, three as the result of failing leak tests conducted in 1990, and one removed earlier after it was determined to be leaking.	TPH were detected in two soil samples from the area of the three former 10,000-gallon USTs by Building 202. TPH were detected in the groundwater at the 1,000-gallon UST location by Building 202.	Soil Groundwater
24	<b>Existing USTs at Building 202:</b> Two existing USTs are located at Building 202.	The two existing USTs passed tank and line leak tests in October 1994.	Soil Groundwater

Key:    TPH    =    Total Petroleum Hydrocarbon  
          AREE   =    Area Requiring Environmental Evaluation  
          UST    =    Underground Storage Tank

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# SECTION 2.0

## PROJECT PLAN AND SCHEDULE

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**T**he operations plan will define the relationships and responsibilities of all personnel involved with conducting the environmental investigation at the WRF installation.

### 2.1 PERSONNEL

A variety of activities must be completed, and several documents must be prepared, to properly complete all tasks identified in the Statement of Work for the Phase I SSI at WRF. EARTH TECH has assembled a project team who will complete the activities identified in the Statement of Work. The members of the EARTH TECH project team and their relationships are presented on Figure 2-1. The specifics of the activities which will be completed by the EARTH TECH team during this project are further explained throughout this Operations Plan.

EARTH TECH typically provides technical direction of a project, on-site management of day-to-day investigation activities, and interpretation, evaluation, and reporting of the data collected. For this Phase I SSI at the WRF installation several subcontractors will be required to complete activities which, although they complement EARTH TECH data collection efforts, are not a part of the EARTH TECH Corporate structure. These subcontracted activities for the WRF Phase I SSI are soil boring and monitor well drilling and installation, geodetic surveying, and chemical and physical analytical services at certified laboratories. EARTH TECH has tentatively identified several qualified potential subcontractors including small disadvantaged businesses in the Commonwealth of Virginia to provide each of the above services. EARTH TECH will follow all appropriate Federal Acquisition Regulations and EARTH TECH's in-house Contractor Purchasing System Review-approved purchasing practices to immediately enter into agreements with qualified, capable firms to provide technical services at WRF.

Figure 2-1 shows the members of the USAEC and their roles on this Phase I SSI project. In addition to the USAEC personnel stationed at the Aberdeen Proving Grounds facility, Mr. Harold Allen, the facility manager for the WRF has been, and will be, an asset to all phases of the USAEC/EARTH TECH data collection efforts. The primary point-of-contact (POC) at Army Research Laboratory (ARL), Adelphi, Maryland for all Phase I SSI activities will be Mr. Robert Craig, P.E. Several additional ARL personnel will also be sources of information to help the USAEC/EARTH TECH data collection efforts, including Mr. John Fuestle and the records/drawing repository staff, to provide additional background information should the need arise.

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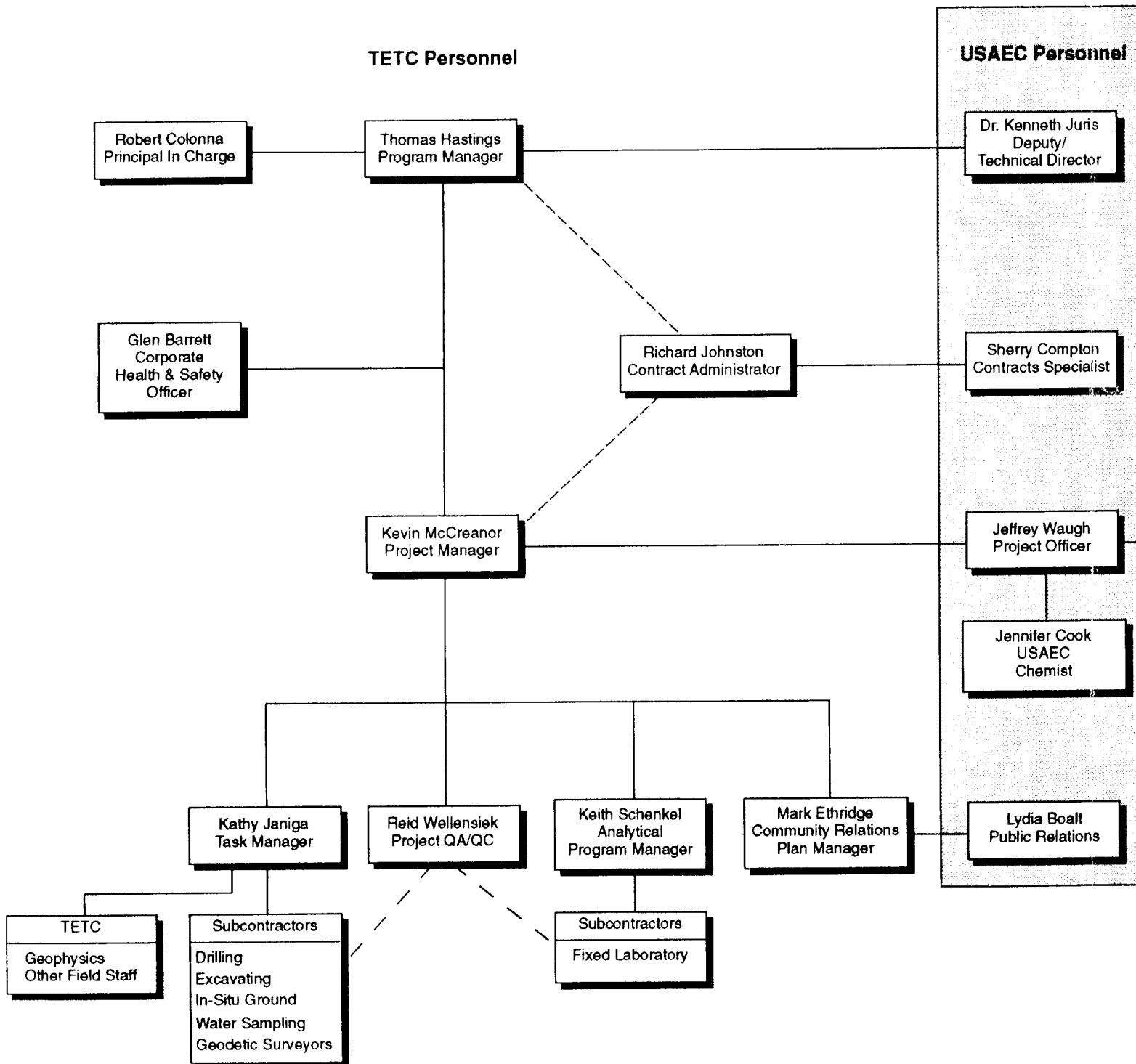
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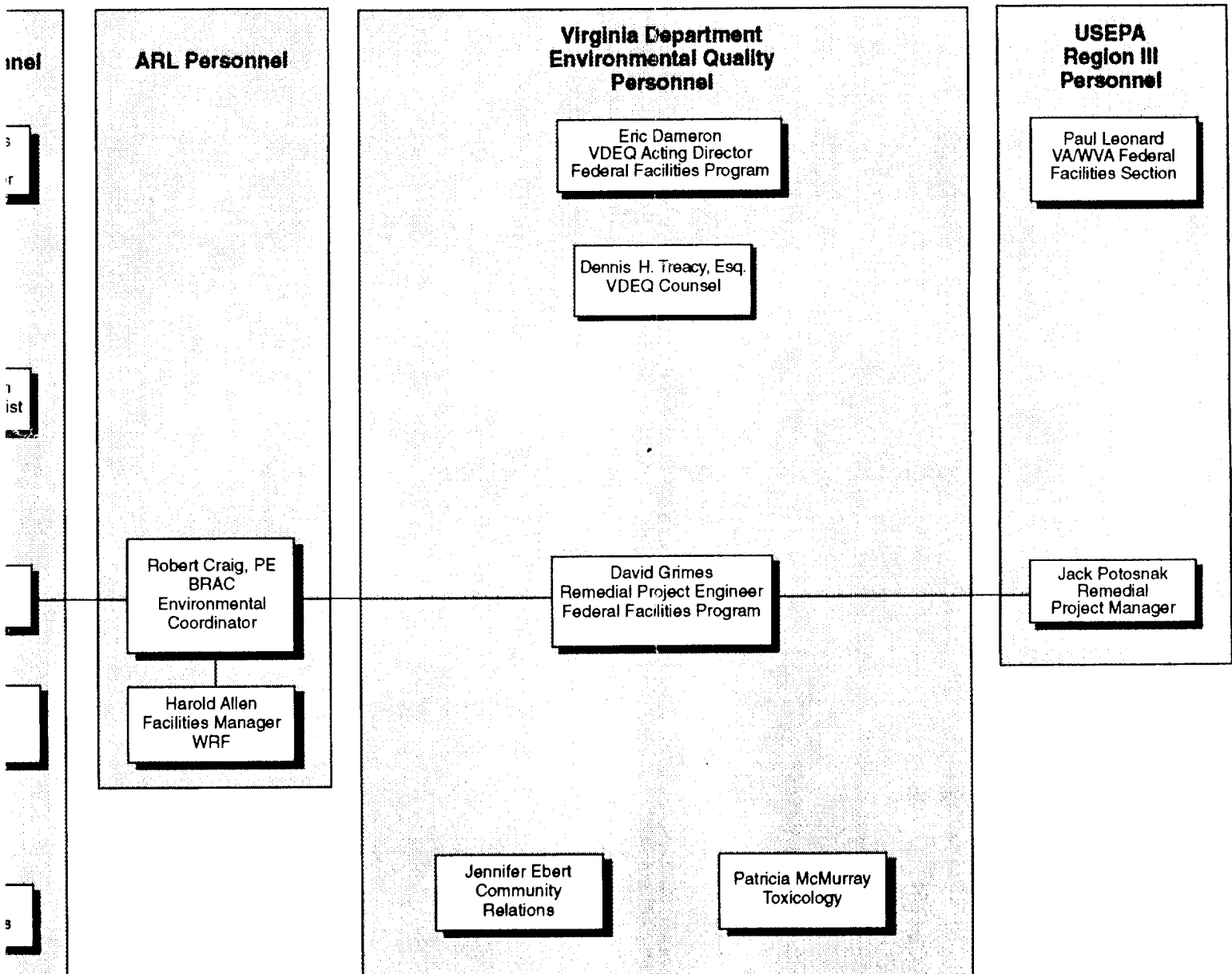
# Organizational Woodbridge Research Facility - S

## TETC Personnel

## USAEC Personnel



# nal Structure - Supplemental Site Inspection



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According to the DOD and State Memorandum of Agreement (DSMOA) signed in 1990, the Commonwealth designated the Virginia Department of Waste Management (VDWM) as the lead Commonwealth agency. Since the signing of this document, several Virginia environmental regulatory agencies including the VDWM were consolidated into the VADEQ. The VADEQ, Waste Division has been retained as the lead Commonwealth regulatory component for the DSMOA for the Phase I SSI of this installation.

As the lead Commonwealth agency, VADEQ shall coordinate among other Commonwealth agencies to represent a single Commonwealth position as to remedial/removal actions at each installation. The VADEQ designated Durwood Willis, VADEQ BRAC Program Manager as the Commonwealth Agency Coordinator (CAC) who shall be the lead technical representative for remedial program management activities. Dennis H. Treacy, Esq. has been designated the VADEQ counsel for matters arising from the remedial program management activities as specified in the implementation plan of the Cooperative Agreement. David Grimes is the Remedial Project Manager for VADEQ with responsibility for WRF.

The U.S. Environmental Protection Agency (USEPA) will also be involved during all Phase I SSI activities. WRF is located in USEPA Region III with the designated POC being Mr. Jack Potosnak.

The USAEC Project Officer (PO), the ARL POC, and the CAC shall be the primary POCs to coordinate the investigations and necessary removal program at WRF, including the resolution of disputes.

It is the intention of the parties that all disputes shall be resolved at the lowest possible level of authority as expeditiously as possible within the following framework. All timeframes for resolving disputes below may be lengthened by mutual consent.

1. Should the PO and CAC be unable to agree, the matter shall be referred in writing as soon as practicable but in no event to exceed ten (10) working days after the failure to agree, to the installation commander and the chief of the designated program office of the VADEQ or their mutually agreed upon representatives designated in writing.
2. Should the installation commander and the chief of the designated program office of the VADEQ, or their mutually agreed upon representatives designated in writing, be unable to agree within ten (10) working days, the matter shall be elevated to the head of the VADEQ and a counterpart member of the lead Service involved who shall be a general/flag officer or a member of the senior executive service.
3. Should the head of the VADEQ and the counterpart DOD representative fail to resolve the dispute within 20 working days the matter shall be referred to the Governor and the Service Secretary concerned for resolution.

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It is the intention of the parties that all disputes shall be resolved in this manner. Alternative dispute resolution methods may be used. In the event that the Governor and the Service Secretary are unable to resolve a dispute, the Commonwealth retains any enforcement authority it may have under Commonwealth and Federal law.

## **2.2 PROJECT SCHEDULE**

The VADEQ response/Phase I SSI activities and their related documentation are to be completed as a sequence of activities. Figure 2-2 presents the overall project deliverable schedule. This schedule projects the delivery dates for all of the documentation which reports the results of the field activities. This Operations Plan is one of several documents created to prepare a focused objective for the Phase I SSI at WRF. A Technical Sampling and Analysis Plan (TSAP) was prepared to describe field sampling procedures for all the activities proposed in this Operations Plan. The QA/QC Plan describes the analytical aspects of the investigation.

These additional documents are being prepared to complement the Operations Plan and refine the focus of the overall project. A Management Resource Utilization Plan is projected to define those resources available to USAEC from EARTH TECH and to assure proper distribution of those resources over the projected schedule. The Final Health and Safety Plan has been accepted and identifies the health standards and safety procedures which are to be followed throughout the completion of the project. A Public Involvement and Response Plan (PIRP) was prepared to identify all relevant community and agency participants to the USAEC/EARTH TECH at WRF.

The Operations Plan contains a summary of past investigations, identification of project goals, and a presentation of methods and controls to achieve the project goals. The Phase I SSI activities within this Operations Plan are designed to comply with USEPA guidance for conducting a SSI. VADEQ compliance response actions projected in this Operations Plan are designed to satisfy both state-wide programs and WRF-specific requirements. Should the projected VADEQ Response Actions identify unanticipated contamination as a result of an unknown release, this Operations Plan will be amended to include details of activities required to complete the additional work either under CERCLA or as a continuation under VADEQ requirements.

The schedule for the field data collection projected to be included in the VADEQ Response Action and the Phase I SSI is shown on Figure 2-3. The investigative process is to follow a sequence of collection of field data, evaluation of the collected data, and assessment of the applicability of the data to fully characterize the environmental conditions at particular locations at the WRF installation.

All activities included in the Phase I SSI at the WRF installation will be summarized in reports which will be prepared following the completion of the field activities. These reports will present the data in the format most appropriate for proper description of the environmental condition of each site investigated, including quantification of any contamination identified at the site. Activities completed for the VADEQ Response

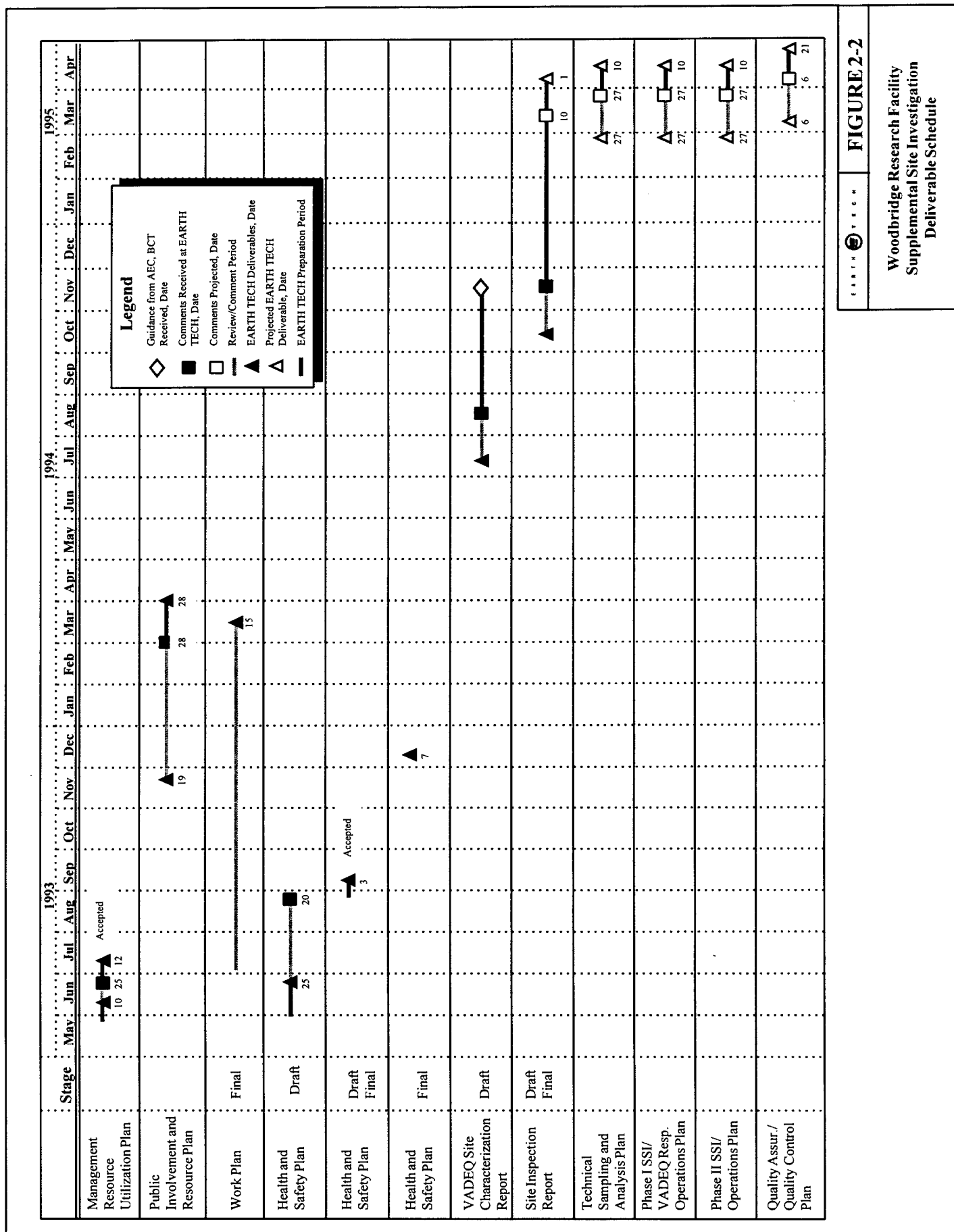


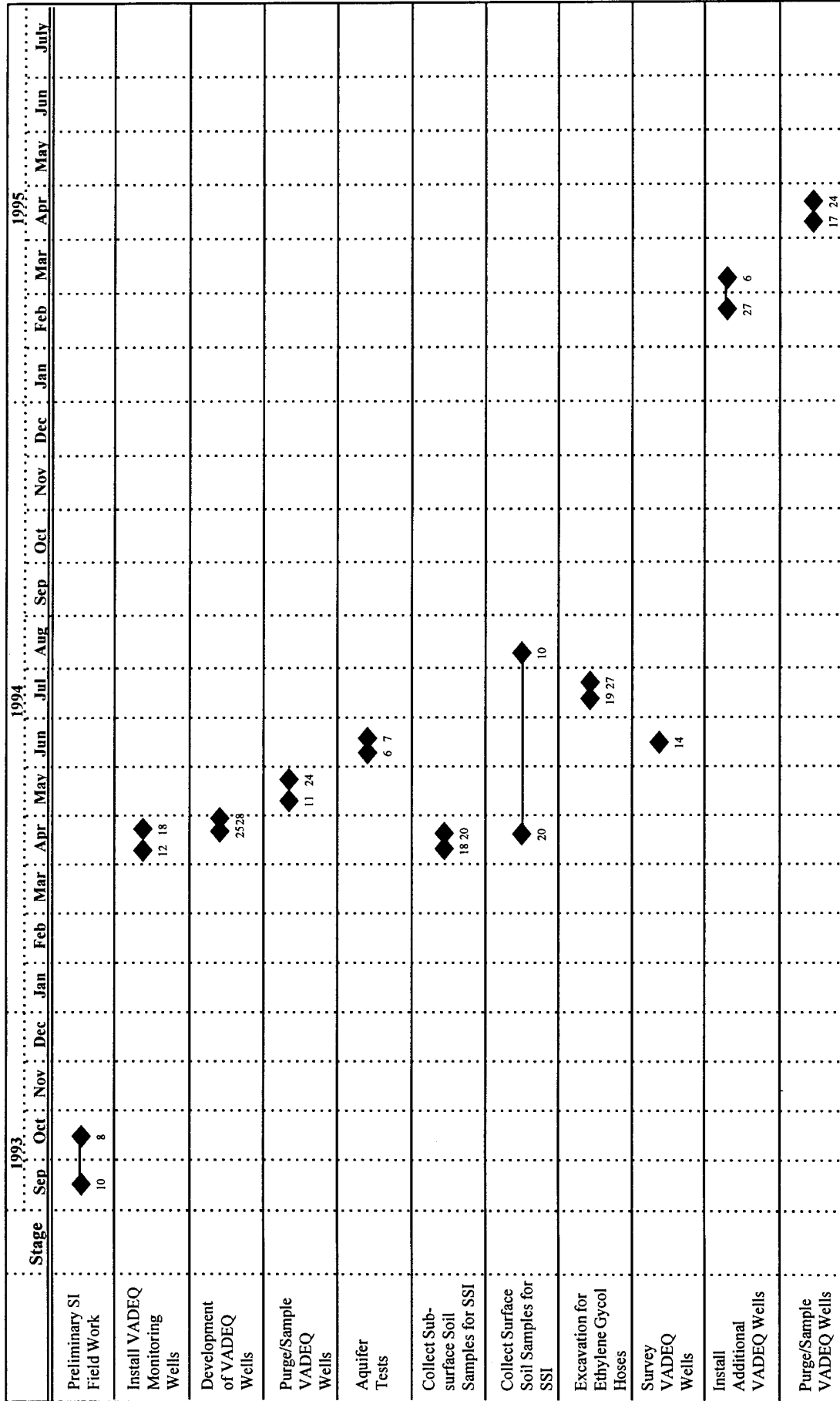
FIGURE 2-2

Woodbridge Research Facility  
Supplemental Site Investigation  
Deliverable Schedule

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**Legend**

- ◆ Actual Date
- ◇ Approximate Date

**FIGURE 2-3**

Woodbridge Research Facility  
Phase I SSI/VADEQ Response Field  
Program Schedule

#SCHEDULE 23A

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Action sites and VADEQ requirements for reporting on investigation at underground storage tank (UST)-related or landfill-related sites will be summarized in a 'Site Characterization Report'.

The schedules presented in this Operations Plan include all activities and documentation projected for a comprehensive VADEQ Response Plan (Site Characterization Report (SCR)) and a Phase I SSI.

## **2.3 OPERATIONS PLAN RATIONALE**

### ***2.3.1 Data Quality Objectives (DQOs)***

Data quality objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data necessary from field and laboratory data collection activities to support specific decisions or regulatory actions. The DQOs describe what data are needed, why the data are needed, and how the data will be used to address the problem being investigated. DQOs also establish numeric limits for the data to allow the data user (or reviewers) to determine whether data collected are of sufficient quality for use in their intended application. DQOs are also discussed in the QA/QC Plan (EARTH TECH, March 1995).

#### **2.3.1.1 Project DQOs**

Data needs for the project include both data generated during screening measurements and data of a sufficient quality that may be used for a full site characterization which may eventually support a Risk Assessment. Sufficient quality and types of information have to be collected so that the data can be included in the IRP database, the Installation Restoration Data Management Information System (IRDMIS).

Data which were collected as part of the Preliminary SI were analyzed by Level I and III protocols as described in the QA/QC Plan (EARTH TECH, March 1995). These results were used for screening purposes and for initial site characterization. Field tests and observations were conducted initially at many sites providing Level I data. A fixed laboratory was used to analyze all water and soil samples collected by USAEC-approved methods (Level III).

Data to be collected for the SSI will be analyzed by USEPA Level I and III protocols as described in QA/QC Plan (EARTH TECH, March 1995). All liquid and solid samples collected during SSI field activities will be shipped to a fixed laboratory for chemical analysis by USAEC-approved methods which satisfy USEPA Level III requirements. These analytical methods and the results for the samples to be collected at WRF for these analyses will be of a sufficient level of quality to achieve both USAEC and USEPA criteria for data quality necessary to support environmental characterization and assessment of risk for a site. These data will be reviewed and validated according to the guidance in the QA/QC Plan.

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Data collected for the VADEQ Response Plan will be analyzed by USEPA Level I and III protocols. A fixed laboratory will be used to analyze all water and soil samples collected by USEPA-approved methods which satisfy USEPA Level III requirements. This is in compliance with VADEQ requirement for the submittal of the SCR. All water and soil samples which are collected during the field activities to support the VADEQ Response Action will be initially characterized using USEPA Level I-quality analytical (primarily field observation) methods. The data for the VADEQ Response Action will then be reviewed and validated by EARTH TECH using USAEC criteria to be put into IRDMIS.

### **2.3.2 Operations Plan Tasks**

The proposed activities for each AREE included in this Operations Plan are identified on Table 2-1. The number of samples and analyses for the Phase I SSI and VADEQ Response Action for Building 202 are included in Table 2-2.

<b>RATIONALE</b>
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A Phase I SSI is to be completed at AREEs 6B, 7, 12, 13, 18, 21, 25 and 26. Contaminants were detected at AREEs 7, 12, 18, 21, and 25 during the Preliminary SI. Further investigation

is necessary to characterize the extent of the contamination. Preliminary SI results from AREEs 6B, 13, and 26 were inconclusive. AREEs for which the VADEQ has made recommendations for investigations based on CERCLA/UST/Leaking UST Program Guidance include AREEs 8, 23, and 24. This grouping is based on the VADEQ request for a SCR at Building 202 of these potentially petroleum-contaminated AREEs. AREE 8 is a former UST leaks/spills area located northeast of Building 202. Preliminary SI results detected total petroleum hydrocarbons (TPHs) in the soil. AREE 23 includes former UST locations. During the Preliminary SI activities, TPH was detected in: the subsurface soil east of Building 202 at the location of three former 10,000-gallon USTs; in the liquid contained within the condensate return pit inside Building 202; and in the groundwater north of Building 202 at the location of a former 1,000-gallon UST. AREE 24 includes the two existing USTs at Building 202, all of which passed tank and line leak tests in October 1994.

<b>METHODOLOGY</b>
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Throughout all phases of the Phase I SSI and VADEQ Response Action the investigation of the nature and extent of known or suspected contaminants, their sources, the media

impacted by the contamination, and the fate and transport mechanism for contaminant movement will be investigated using a variety of techniques, as summarized below.



**TABLE 2-1**  
**SUMMARY OF PROPOSED ACTIVITIES**

Activity	AREEs										
	6B	7	8	12	13	18	21	23	24	25	26
<b>WATER SAMPLING</b>											
Groundwater via Existing Wells								x			
Groundwater via New Wells			x								
Surface Water											
Other Liquid			x		x						x
<b>SEDIMENT/SOIL SAMPLING</b>											
Sediment											
Surface Soil <sup>(1)</sup>										x	
Subsurface Soil via Excavation											x
Subsurface Soil via Drilling Operations	x	x	x	x	x		x	x			
<b>FIELD OPERATIONS</b>											
Geophysics/Utility Clearance	x	x	x	x	x	x	x	x			
Excavation											x
Borehole Installation	x	x	x	x	x			x			
Well Installation			x				x				
Aquifer Testing			x								
Geodetic Surveying	x	x	x	x	x		x	x		x	x
Site Restoration	x	x	x	x	x		x	x			x
Sampling of Joint Material						x					

**Key:** AREE = Area Requiring Environmental Evaluation

**Note:** x = Proposed Supplemental Site Inspection, or Virginia Department of Environmental Quality Response Plan Activities.

<sup>(1)</sup> Surface Soil samples consist of those samples collected less than 2 feet below ground surface.

TABLE 2-2

**SUMMARY OF SOIL AND GROUNDWATER SAMPLE ANALYSES FOR SUPPLEMENTAL SITE INSPECTION AND VADEQ  
RESPONSE ACTION ACTIVITIES**

Soil	Number of Samples	Number of Replicates/ Duplicates	Number of Rinsate Blanks	Number of Trip Blanks	Number of Ambient Blanks	Total
<b>PHASE I SSI</b>						
Metals by Inductively Coupled Argon Plasma (JS14)	83	8	8	NA	NA	99
Total Petroleum Hydrocarbons (E418.1)	20	2	2	NA	NA	24
Ethylene Glycol by Gas Chromatograph	6	1	1	NA	NA	8
Volatile Organic Compounds by Purge and Trap (LM33)	22	2	2	2	NA	28
Acid & Base Neutrals (LM30)	22	2	2	NA	NA	26
Polychlorinated Biphenyls/Pesticides by Gas Chromatograph (LH19)	50	5	5	NA	NA	60
Lead (SW6010)	83	8	8	NA	NA	99
<b>Water</b>						
Metals by Inductively Coupled Argon Plasma (SS15)	1	0	1	NA	NA	2
Total Petroleum Hydrocarbons (E418.1)	1	0	1	NA	NA	2
Ethylene Glycol by Gas Chromatograph	1	0	1	NA	NA	2
Volatile Organic Compounds by Purge and Trap (UM05)	1	0	1	1	1	4
Acid & Base Neutrals (UM06)	1	0	1	NA	NA	2
Polychlorinated Biphenyls/Pesticides by Gas Chromatograph (UH21)	1	0	1	NA	NA	2
Lead (SW6010)	1	0	1	NA	NA	2

TABLE 2-2

**SUMMARY OF SOIL AND GROUNDWATER SAMPLE ANALYSES FOR SUPPLEMENTAL SITE INSPECTION AND VADEQ  
RESPONSE ACTION ACTIVITIES**

Continued

Soil	Number of Samples <sup>(1)</sup>	Number of Replicates/ Duplicates	Number of Rinsate Blanks	Number of Trip Blanks	Number of Ambient Blanks	Total
<b>VADEQ RESPONSE ACTION</b>						
Total Petroleum Hydrocarbons (E418.1)	37	4	4	NA	NA	45
Polychlorinated Biphenyls/Pesticides by Gas Chromatograph (LH19)	37	4	4	NA	NA	45
Lead (SW6010)	37	4	4	NA	NA	45
Benzene, Toluene, Ethylbenzene, Xylenes (SW8020)	37	4	4	4	NA	49
<b>Water</b>	<b>Number of Samples<sup>(1)</sup></b>	<b>Number of Replicates/ Duplicates</b>	<b>Number of Rinsate Blanks</b>	<b>Number of Trip Blanks</b>	<b>Number of Ambient Blanks</b>	<b>Total</b>
Total Petroleum Hydrocarbons (E418.1)	19	2	2	NA	NA	23
Benzene, Toluene, Ethylbenzene, Xylenes (SW8020)	19	2	2	2	2	27
Lead (SW6010)	19	2	2	NA	NA	23

Key: NA = Not Applicable

- 
- ★ **Water Sampling.** Samples will be collected from the groundwater to determine the extent and concentration of contaminants as required to determine site-specific conditions. The sampling activities to be completed during the Phase I SSI and VADEQ Response Action are shown in Table 2-1.
  - ★ **Sediment/Soil Sampling.** Soil sampling will be conducted to define site lithology and the depth, areal extent, and concentration of soil contaminants. See Table 2-1 for proposed soil sample collection actions for the Phase I SSI and VADEQ Response Action.
  - ★ **Excavation.** Excavation will be performed to visually inspect site lithology and previously disposed materials in open dumps, and/or to identify contamination associated with past activities at a site. Excavation methods will be used extensively to obtain subsurface soil samples during this project. A standard, self-propelled backhoe will be sufficient for these activities.
  - ★ **Borehole/Well Installation.** Boreholes and/or monitoring wells will be installed for the collection of soil samples to document hydrologic conditions and lithology, and to allow for chemical analysis of soil and groundwater. This activity will better define the nature and extent of contamination at a site and provide reproducible sampling locations which may be required for future investigations or actions.
  - ★ **Geodetic Surveying.** A state-certified land surveyor will perform a geodetic survey to record the locations of newly installed wells and boreholes. The locations of trenches which are excavated and all sampling locations will also be surveyed. The elevations and locations will be recorded on project and site-specific maps. These data will provide a permanent record of sampling locations.
  - ★ **Geophysical Surveys.** Wherever necessary, geophysical investigations will be conducted. Magnetometer and electromagnetic induction (EMI) surveys will be used to clear the sites for drilling. At some sites, the magnetometer and EMI surveys will also be used to identify potential locations of buried ferrous objects, such as drums. Ground penetrating radar (GPR) will be used at some sites to locate trenches, disposal pits, non-ferrous pipelines or USTs, and other disturbed areas.

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# SECTION 3.0

## SITE EVALUATION FOR PHASE I SSI

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**T**his section describes the AREEs to be investigated as part of this Phase I SSI. A site description, a summary of findings from previous investigations, and the proposed sampling plan is included for each AREE. The IRDMIS map file included in Appendix A identifies the Phase I SSI/VADEQ Response Action sample locations which were estimated from a map with accuracy unknown. The coordinates will be updated after the surveying is completed.

### 3.1 AREE 6B - FORMER DUMP

#### 3.1.1 *Site Description and History*

AREE 6B is a former dump located at the intersection of Deephole Point Road and Shady Road near the southern boundary of WRF, across from AREE 1. This AREE was identified during the ENPA based upon ground scars and soil disturbances depicted in aerial photographs. Debris was also observed in the area of the former dump during the ENPA.

AREE 6B was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. No debris was encountered in three trenches. Two suspected downgradient groundwater samples were collected from direct push points, and no polychlorinated biphenyls (PCBs) or volatile organic compounds (VOCs) were detected in the groundwater samples.

#### 3.1.2 *Extent of Contamination*

The extent of contamination has not been determined for AREE 6B. Past investigations and history of use of this AREE show little evidence of contamination.

#### 3.1.3 *Proposed Sampling Activities and Analytical Program*

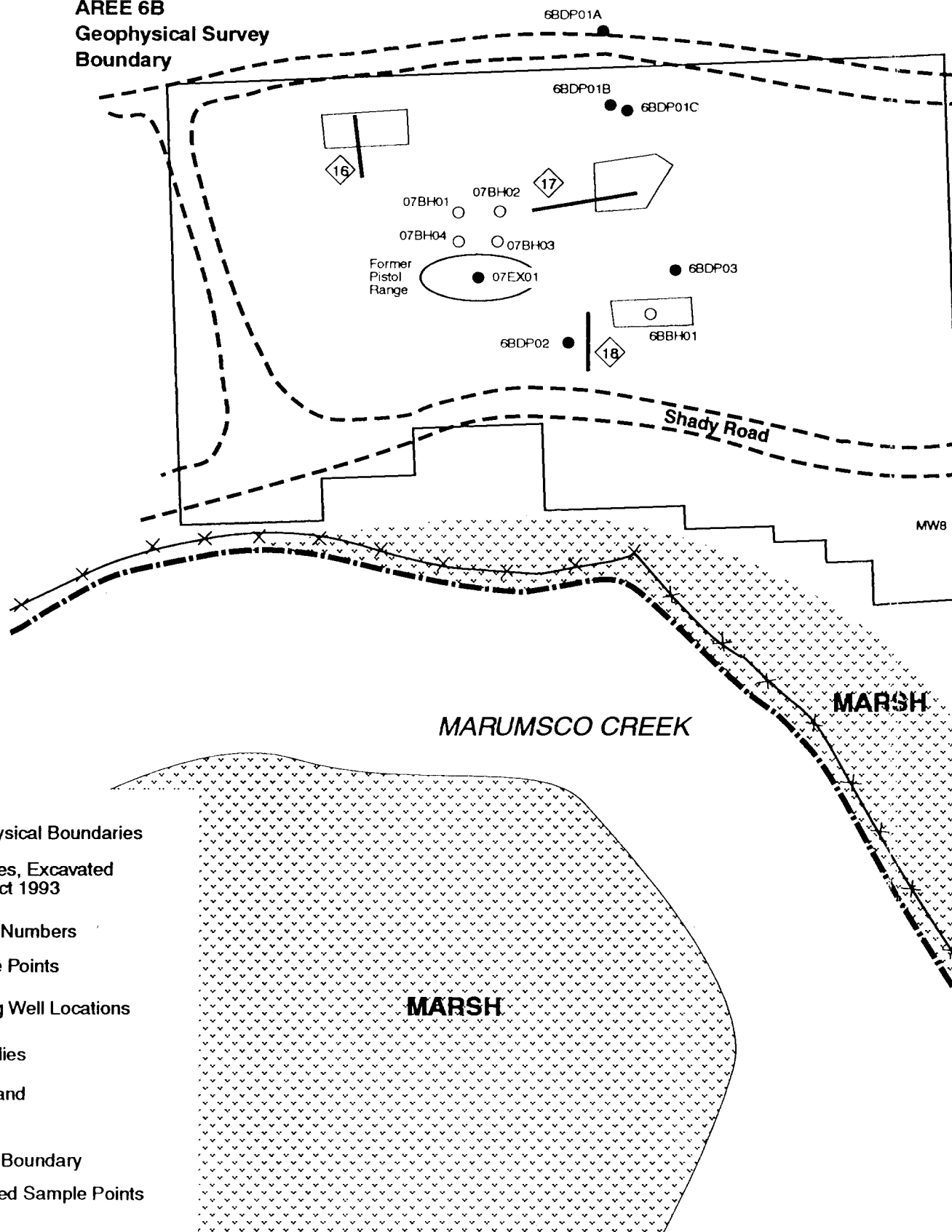
One hand-augered borehole, depicted in Figure 3-1, will be completed at AREE 6B, and two soil samples will be collected from this borehole. These two soil samples will be collected from the 0.5- to 1.5-foot depth and the 4.5- to 5.5-foot depth and will be analyzed for metals, TPH, VOCs, semivolatile organic compounds (SVOCs), PCBs, and pesticides as well as soil moisture.

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









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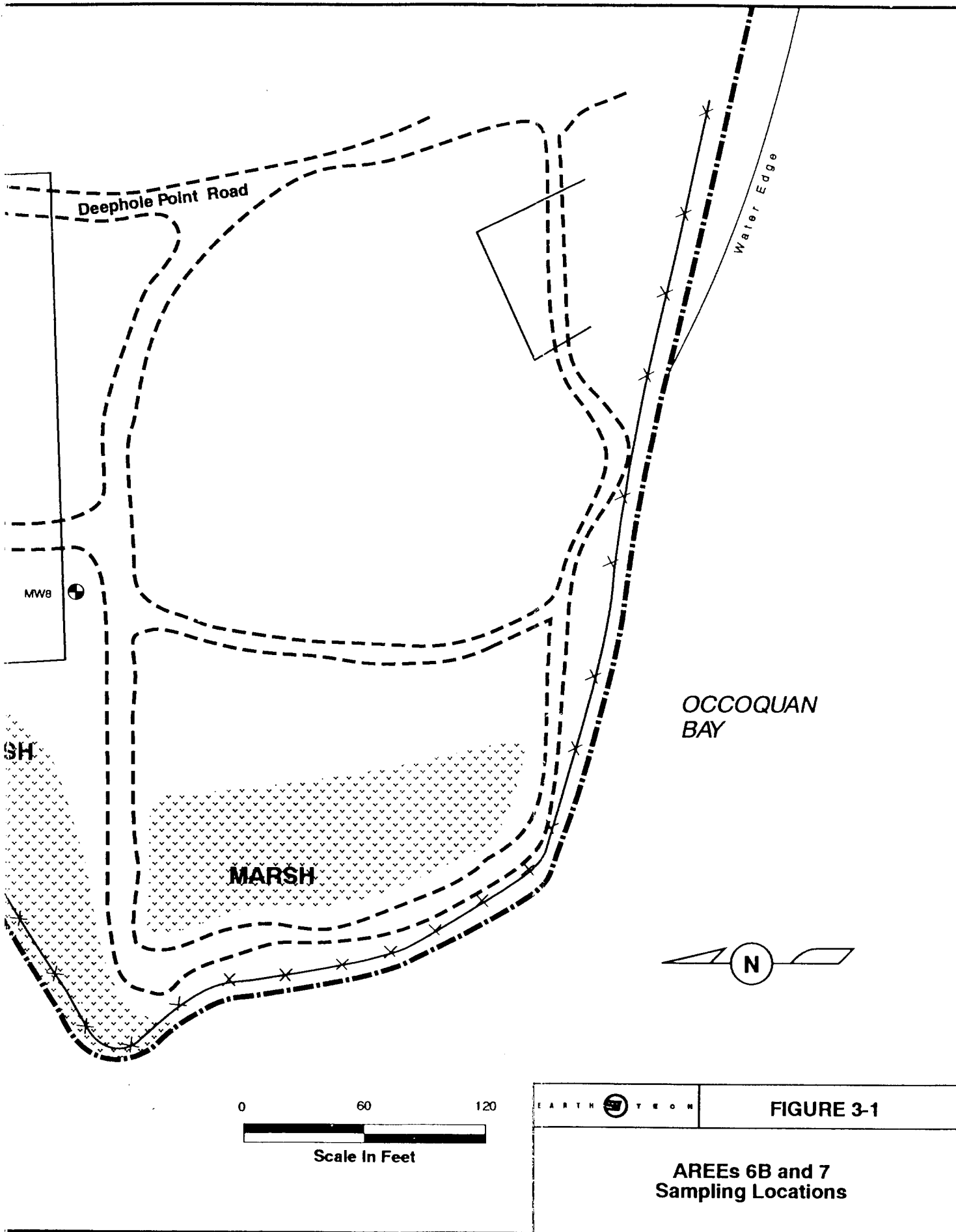
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**AREE 6B  
Geophysical Survey  
Boundary**



**KEY**

-  Geophysical Boundaries
-  Trenches, Excavated Sept-Oct 1993
-  Trench Numbers
-  Sample Points
-  Existing Well Locations
-  Anomalies
-  Marshland
-  Fence
-  Facility Boundary
-  Proposed Sample Points





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## **3.2 AREE 7 - FORMER PISTOL RANGE**

### ***3.2.1 Site Description and History***

AREE 7 is a former pistol range site located on an open hillside between Deephole Point Road and Shady Road. The hillside is situated approximately 75 yards west of the landfill identified in AREE 1. Reportedly, the range was used for qualifications of small arms firing on a semi-annual basis during the 1970s. This activity occurred for an unknown number of years before the firing range was covered with backfill material and firing practice was stopped as a regular activity at WRF (Weston, 1992).

AREE 7 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. The location of the former pistol range was identified by the facility manager and a 5 feet × 5 feet × 4 feet area was excavated and examined for bullets. No bullets were encountered. Metals were detected in a soil sample.

### ***3.2.2 Extent of Contamination***

The extent of contamination, if any, is unknown for AREE 7. Samples collected from AREE 7 during the initial SI contained metals; beryllium, cobalt, copper, nickel, and zinc slightly exceeded naturally occurring levels.

### ***3.2.3 Proposed Sampling Activities and Analytical Program***

A facility representative has revealed that the impact area for the pistol range is now under 15 feet of fill. Therefore, four boreholes will be hand augered, and nine soil samples will be collected from each borehole at depths of 1, 2, 3, 4, 8, 12, 13, 14, and 15 feet. The locations of these proposed boreholes are depicted in Figure 3-1.

These four boreholes will be hand augered approximately 15 feet east and uphill from test pit location 07EX01 in a square formation with the boreholes spaced 15 feet apart.

All 36 samples will be analyzed for metals, and one replicate sample will be collected with one of the soil samples from each borehole. In addition, the hand auger cuttings will be visually examined for bullets.

## **3.3 AREE 12 - DRUM STORAGE AREA**

### ***3.3.1 Site Description and History***

AREE 12 is located on the paved area just north of Building 202. Building 202 housed the maintenance facilities as well as the vehicle repair facility for WRF. A wide range of organic and inorganic compounds and products were temporarily stored in drums, unprotected from the weather, on the pavement of this area. There is no record of large, uncontrolled releases of any of the products stored at this AREE. Recent visual

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inspection of the area indicated worn and discolored asphalt at the surface of the site. The paved area is relatively flat, eventually draining to the oil/water separator which is AREE 11.

AREE 12 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Four areas of the pavement were excavated, and two composite soil samples were collected from under the pavement and analyzed for VOCs, SVOCs, and TPH.

### ***3.3.2 Extent of Contamination***

During the Preliminary SI, acetone, methyl ethyl ketone (MEK), and TPH were detected in both soil samples. The extent of contamination from AREE 12 is not known.

### ***3.3.3 Proposed Sampling Activities and Analytical Program***

Subsequent to the Preliminary SI, the BCT requested additional sampling to be conducted as part of the SSI. Therefore, four boreholes will be drilled at AREE 12 during the SSI. Two of these boreholes will be drilled through the asphalt pavement, and the other two will be drilled approximately 2 feet north of the asphalt pavement. The two boreholes located on the asphalt pavement will be completed to 12 feet, and the two boreholes drilled north of the asphalt will be completed to 10 feet. The locations of the proposed boreholes are depicted in Figure 3-2.

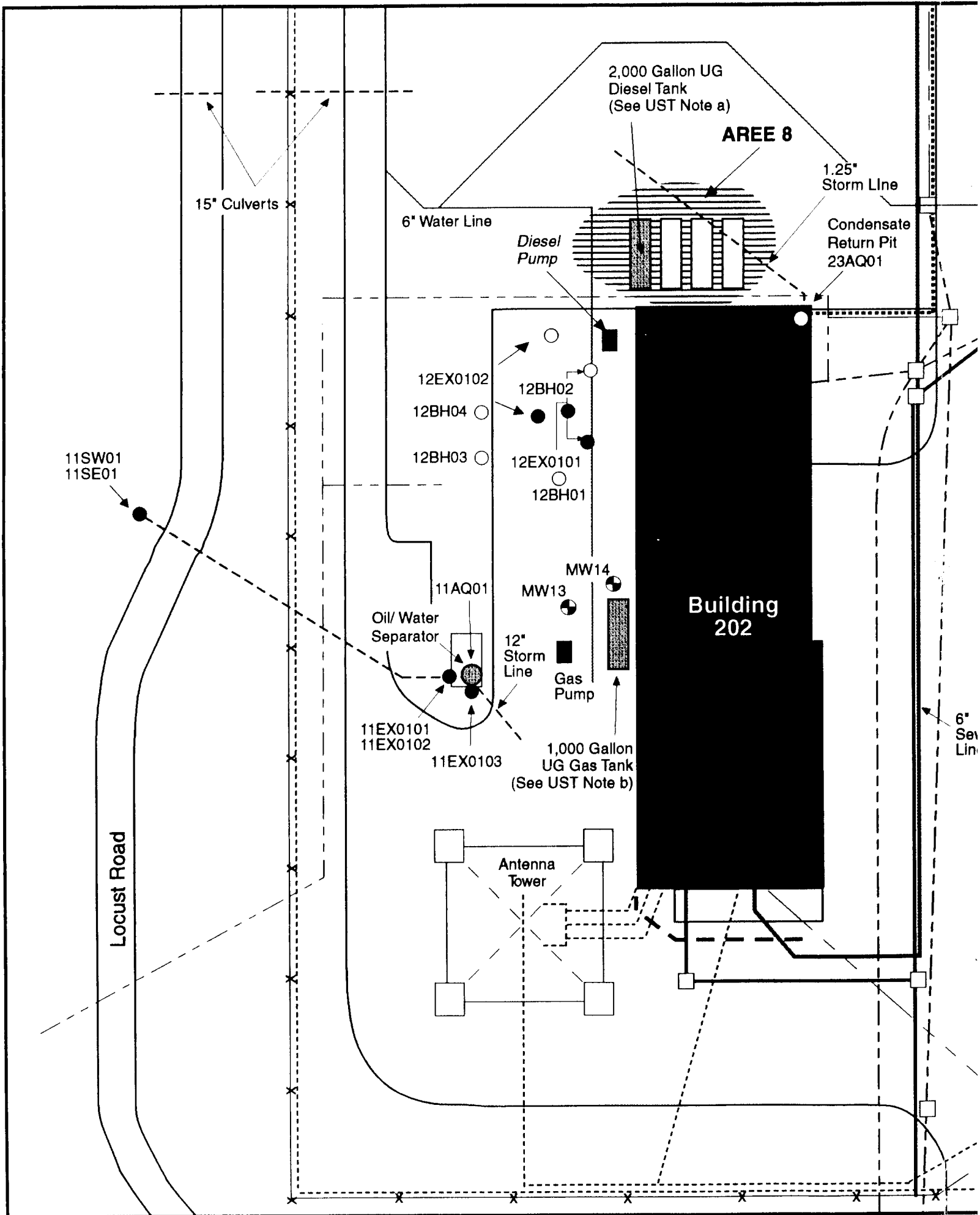
A total of 10 soil samples will be collected from the four boreholes. Three subsurface soil samples will be collected from each of the two boreholes drilled in the paved area, and these samples will be collected at depths of 1, 5, and 10 feet. Two subsurface soil samples will be collected from each of the two boreholes drilled north of the paved area, and these samples will be collected at depths of 2 and 8 feet.

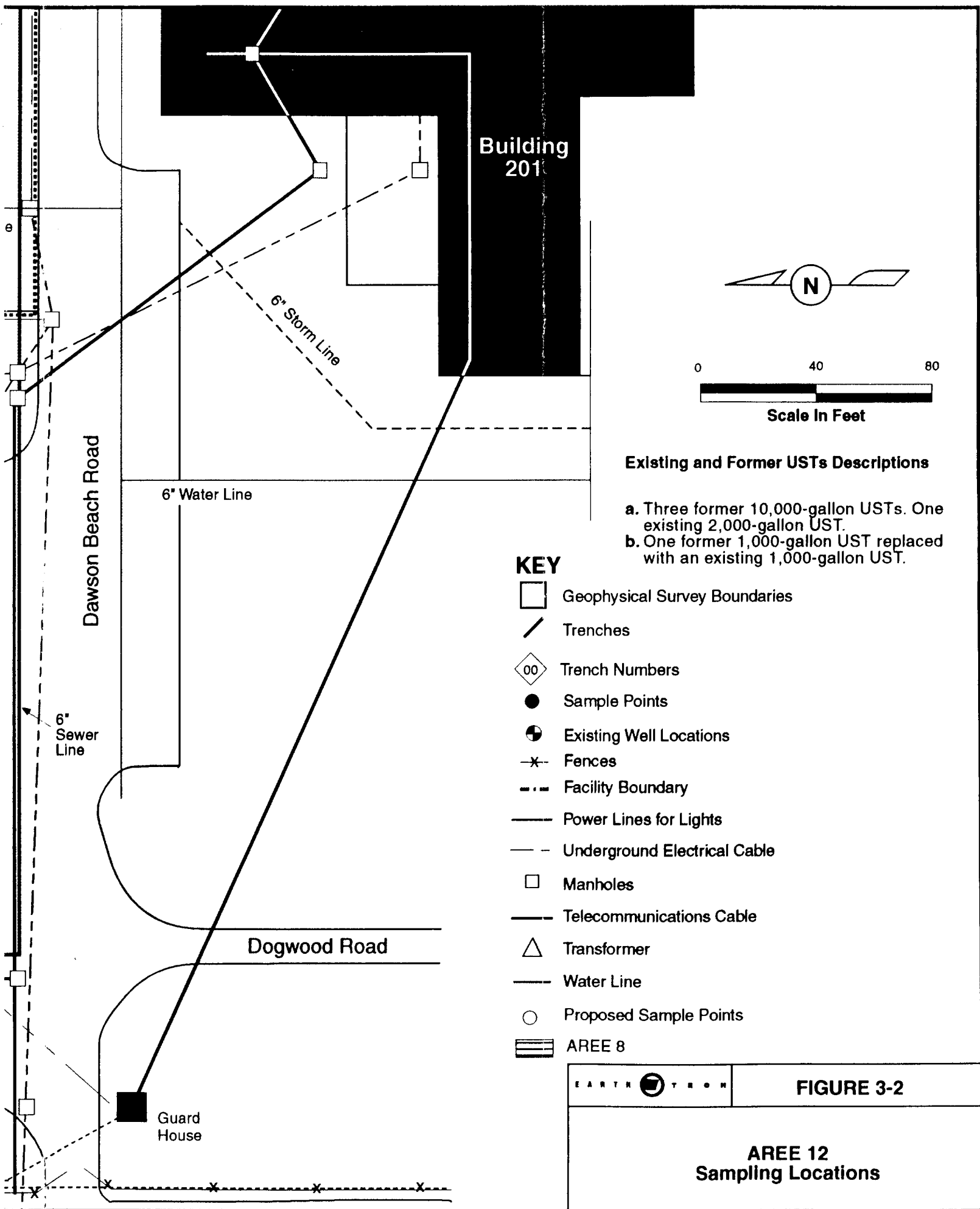
All of the soil samples collected at AREE 12 during the SSI will be analyzed for metals, TPH, VOCs, SVOCs, PCBs, and pesticides.

## **3.4 AREE 13 - ACID NEUTRALIZATION TANK**

### ***3.4.1 Site Description and History***

AREE 13 is a 1,000-gallon concrete underground acid neutralization tank located just west of Building 211. This location is adjacent to a battery room within the building. The tank was installed at the time of Building 211 construction in 1979. The purpose of the tank is to contain any spills that may originate in this battery room. The battery room is used for storage and charging of small lead/acid batteries. The room has a concrete floor and a safety shower. Spills or shower water drain to the tank via a floor drain. The tank has an overflow to the sanitary sewer but is large enough to





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contain expected spills. There is anecdotal information that while the tank currently does not contain neutralizing chemicals, twice a year an outside contractor added a neutralizing chemical to the contents of the tank and flushed the tank with water; however, there is no documentation available to prove that this preventive maintenance activity actually occurred. There have been no significant spills reported in the battery room (Weston, 1992).

AREE 13 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Two sides of the tank were excavated and the tank appeared in good condition. Soil pH results were between 6 and 7.

### ***3.4.2 Extent of Contamination***

The extent of contamination, if any, is not known at AREE 13. Except for the pH analyses, no samples have been collected for analysis from AREE 13.

### ***3.4.3 Proposed Sampling Activities and Analytical Program***

Subsequent to the Preliminary SI, the BCT requested that additional sampling be conducted as part of an SSI. Therefore, three boreholes will be installed in the vicinity of AREE 13. Two of the boreholes will be drilled approximately 3 feet west of the tank to a depth of 8 feet, and the other borehole will be hand augered 1 foot southeast of the tank to a depth of 6.5 feet. The locations of the proposed boreholes are depicted in Figure 3-3.

One sample will be collected from each borehole at a depth of approximately 6 feet, and each of these samples will be analyzed for inorganic compounds.

## **3.5 AREE 18 - FLAMMABLE/BATTERY STORAGE (BUILDING 204)**

### ***3.5.1 Site Description and History***

AREE 18 is Building 204 which is a small two-room concrete-floored structure used to store flammable materials in one room and vehicle batteries in the second room. The flammable storage room has a concrete floor with no drain and no curb at the door. The battery room has a concrete floor with a safety shower and drain in one corner. The shower does not have a curb, which potentially could allow any acid spillage to flow into the drain. The discharge point of the drain uncovered during the initial SI is a gravel pit buried approximately 5 feet below ground surface.

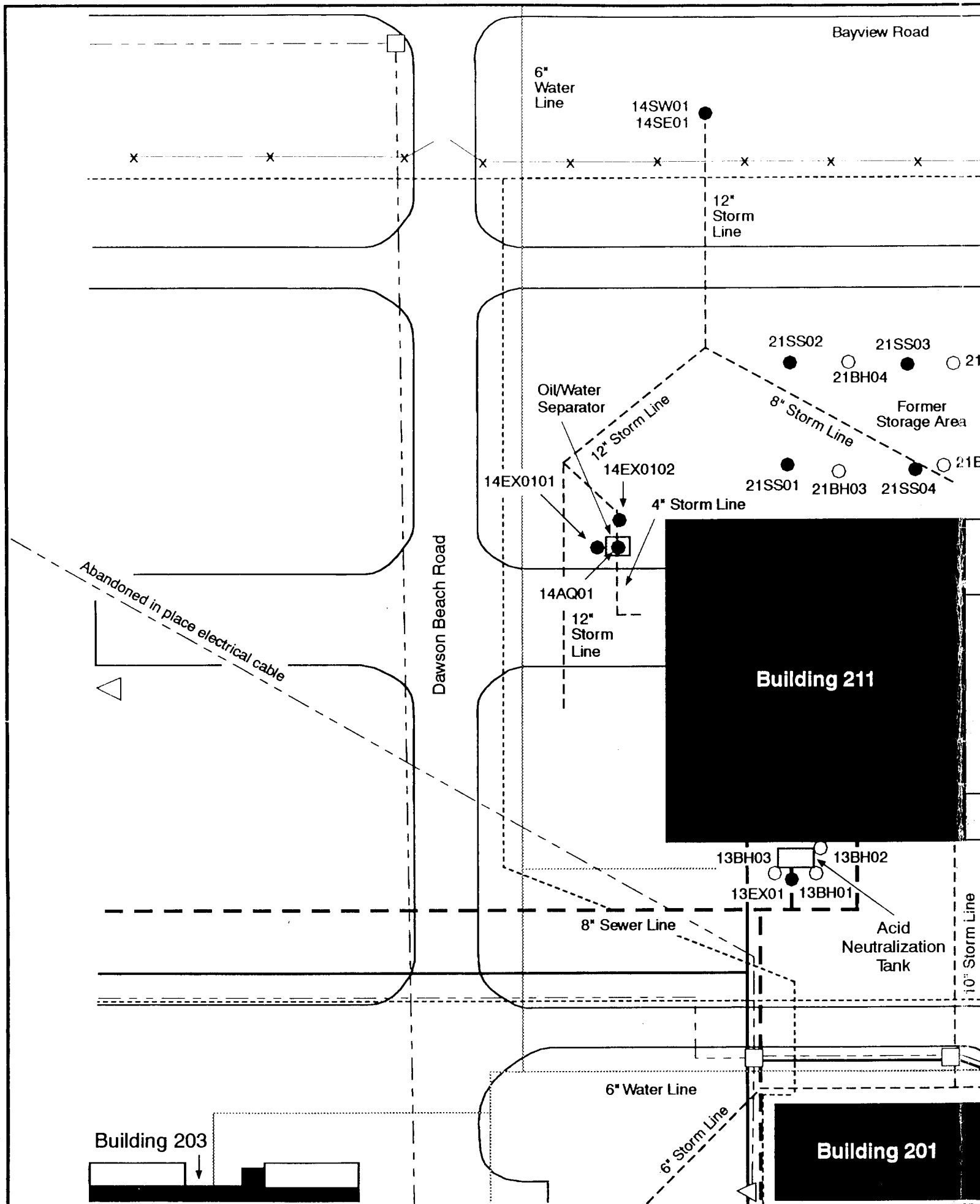
AREE 18 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Four soil samples were collected and analyzed for VOCs, SVOCs, and metals. Manganese was detected slightly exceeding background and regional U.S. Geological Survey (USGS) ranges. Toluene was also detected in one soil sample.

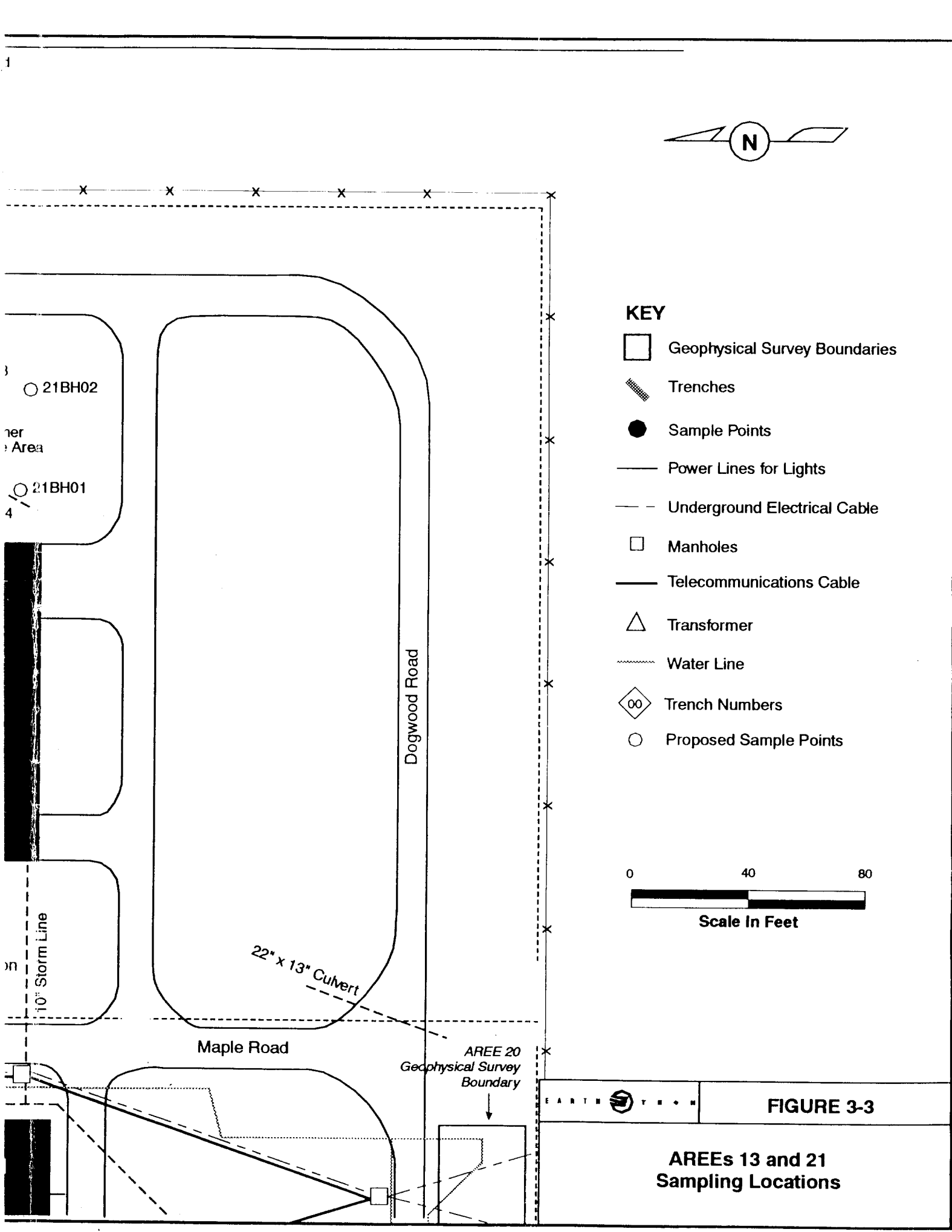
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### ***3.5.2 Extent of Contamination***

The extent of contamination at AREE 18 has not been determined. Evidence for significant contamination has not been found in past investigations or history of uses of AREE 18.

### ***3.5.3 Proposed Sampling Activities and Analytical Program***

Subsequent to the Preliminary SI, the BCT requested that additional sampling be conducted as part of an SSI. Site reconnaissance has revealed that contaminants resulting from battery and/or flammable materials storage could potentially be present in the joint material of Building 204.

Therefore, two samples of the building's joint material which fills the space between the floor and the walls will be collected during the SSI. One of these samples will be taken from the east room and the other from the west room of Building 204. Both samples will be analyzed for metals, VOCs, and SVOCs.

## **3.6 AREE 21 - FORMER STORAGE AREA**

### ***3.6.1 Site Description and History***

AREE 21 is an area to the east of Building 211 which was used as a storage yard before Building 211 was built. Reportedly, transformers and capacitors containing PCBs were stored in the area prior to disposal (Weston, 1992).

AREE 21 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. No PCBs were detected in the four surface soil samples. TPH concentrations were detected in all four soil samples ranging from 30 to 55 parts per million (ppm).

### ***3.6.2 Extent of Contamination***

The extent of contamination is not known at AREE 21. TPH were detected, but the extent has not been investigated.

### ***3.6.3 Proposed Sampling Activities and Analytical Program***

Subsequent to the Preliminary SI, the BCT requested that additional sampling be conducted as part of an SSI. Therefore, four boreholes will be drilled during the SSI at locations identified by the BCT. Each borehole will be drilled to a depth of 10 feet. The locations of these proposed boreholes are depicted in Figure 3-3.

Two soil samples will be collected from each borehole: one at the 2- to 4-foot interval and a second at the 8- to 10-foot interval. A replicate sample will also be collected

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at one of the sampling locations. All samples will be analyzed for TPHs, VOCs, SVOCs, PCBs, and pesticides.

### **3.7 AREE 25 - SEWAGE INJECTION AREA**

#### ***3.7.1 Site Description and History***

In 1974, sanitary sewer sludge was injected into the ground throughout the northern part of the facility. This practice was stopped after complaints from neighbors. The sludge was obtained from the Occoquan Sanitary District near Woodbridge and the Blue Plains sanitary treatment plant in Washington, D.C. Reportedly, approximately 20,000 gallons per day (gpd) was injected to a depth of 18 inches over a 4-month period. Analyses of the sludge were not obtained, but reportedly only municipal sanitary sewage was processed at these plants (Weston, 1992).

AREE 25 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Six surface soil samples were collected from the three sewage injection areas. Metals within naturally occurring levels were detected in all six samples with the exception of cobalt which slightly exceeded background levels.

#### ***3.7.2 Extent of Contamination***

The extent of contamination, if any, is unknown for AREE 25. Samples collected during the initial SI contained metals at naturally occurring levels, with the exception of cobalt.

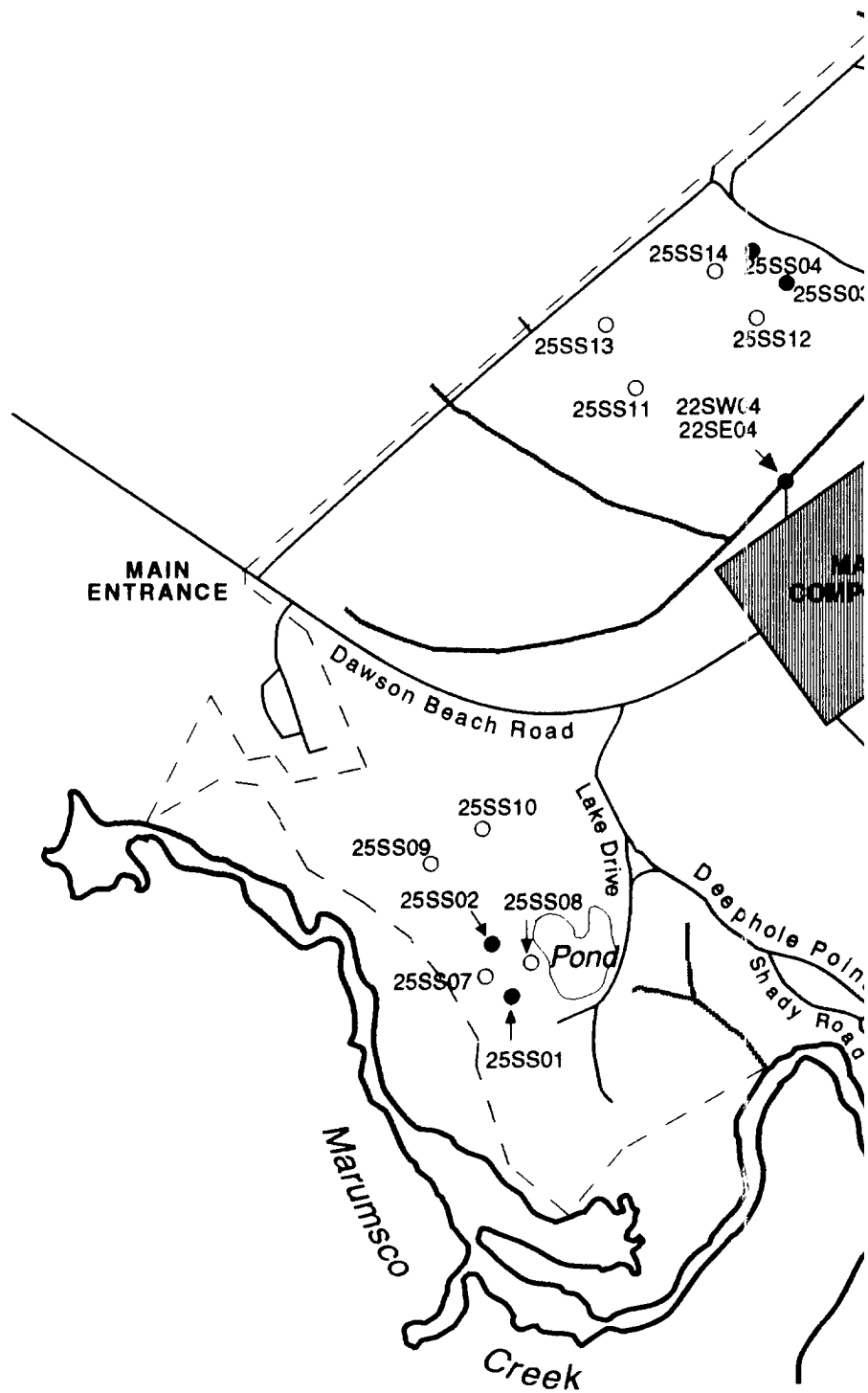
#### ***3.7.3 Proposed Sampling Activities and Analytical Program***

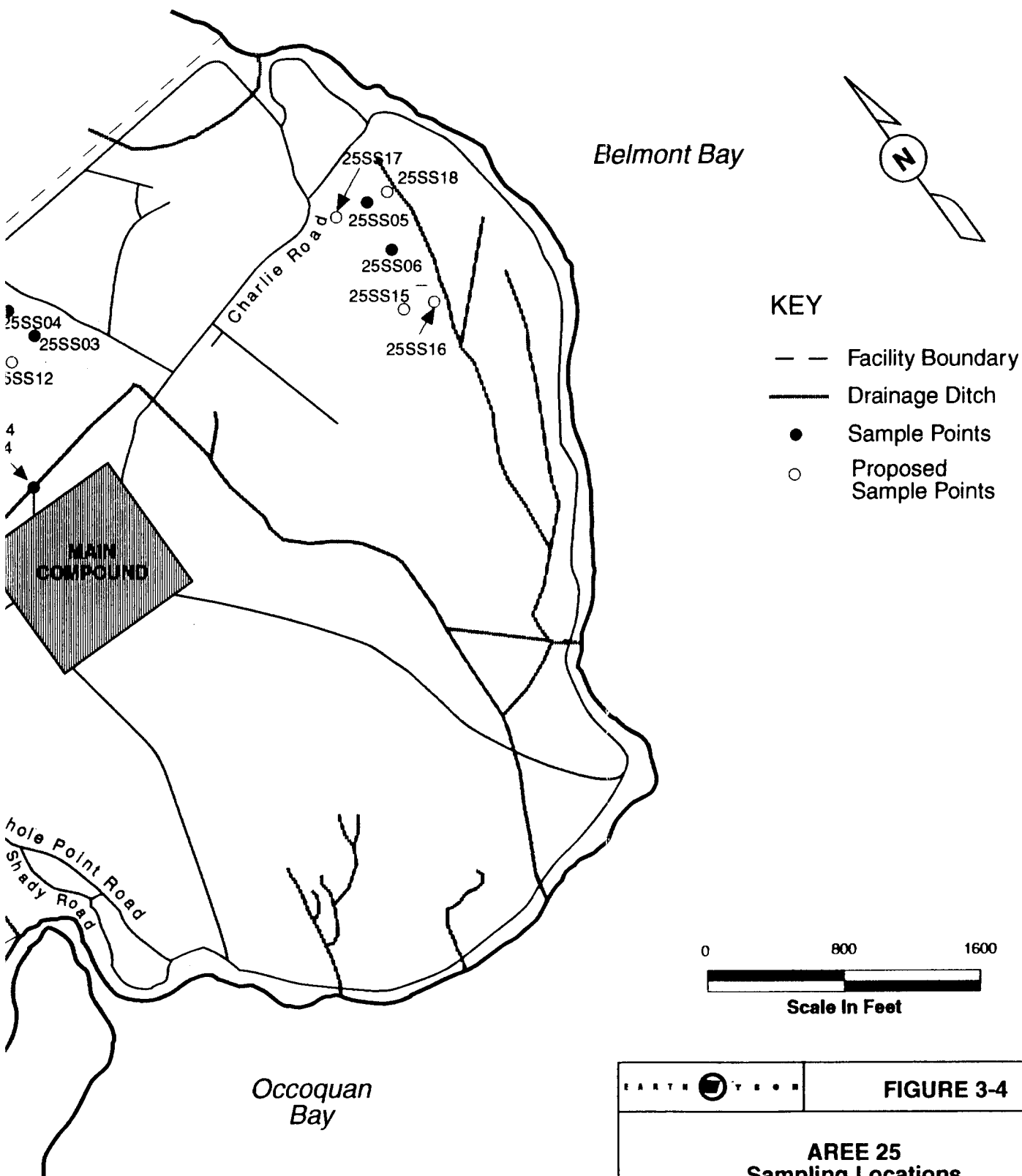
Subsequent to the Preliminary SI, the BCT requested that additional sampling be conducted as part of an SSI. The SSI activities will consist of collecting four soil sample pairs and a replicate from each of the three previously identified sewage injection areas. The proposed sampling locations are depicted in Figure 3-4. Each sample pair will consist of one sample collected at a depth of 0.5 feet and a second hand augered sample at 2 feet. All samples will be analyzed for metals, PCBs, and pesticides.

### **3.8 AREE 26 - BURIED ANTIFREEZE PIPES**

#### ***3.8.1 Site Description and History***

Antifreeze in rubber hoses was buried in the ground south of Building 306 as a test of a personnel intrusion and detection system. The antifreeze, which consisted mainly of ethylene glycol, was put in neoprene rubber hoses, which were cut to length, plugged at one end, filled with fluid, and sealed at the other end. The tubes were then buried at a depth of 1 foot to 3 feet. The tubes were placed from 6 to 20 feet





EARTH SYSTEMS

**FIGURE 3-4**

**AREA 25  
Sampling Locations**

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apart in a random pattern over a square area approximately 2,000 feet on a side. The neoprene rubber hose varied from  $\frac{3}{4}$  inch to 2 inches in diameter. The hose is uncovered from time to time during excavations in the area. When it is uncovered, it generally still contains antifreeze, which usually leaks from the hose into the ground during the excavation process. Most of the hose is still in the ground (Weston, 1992). No investigations before the Preliminary SI have been performed for this site; however, the ENPA recommended soil sampling and removal of the hoses. AREE 26 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Nine trenches were excavated; however, no hoses were uncovered. No samples were collected.

### ***3.8.2 Extent of Contamination***

The extent of contamination, if any, is unknown for AREE 26. Samples have not yet been collected at AREE 26.

### ***3.8.3 Proposed Sampling Activities and Analytical Program***

Subsequent to the Preliminary SI, the BCT requested that AREE 26 be further investigated under an SSI. The SSI will begin with a second site reconnaissance to be conducted with ARL personnel.

A total of eight trenches will be excavated with a backhoe during the SSI in an effort to locate the buried hoses. The first trench will be excavated beginning approximately 5 to 10 feet south of the western intersection of the road to the test facility and continuing parallel to the road, along an eastern bearing. This proposed trench location is depicted in Figure 3-5. The other seven trench locations will be decided based upon the results of the first trench. The first trench will be dug at a depth of 5 feet, and the other trench depths will be determined based upon the findings in the first trench.

Six soil samples, a replicate sample, and an aqueous sample of the liquid in a hose will be collected where the hoses are found. The soil samples will be analyzed for metals and ethylene glycol. The aqueous sample will be analyzed for metals, TPHs, VOCs, SVOCs, PCBs, pesticides, and ethylene glycol.

All trenches will be backfilled with the excavated soil, and the hoses will remain in the backfilled trenches.

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0 60 120



Scale In Feet

**KEY**

- Existing Trenches
- Geophysical Boundaries
- Trench Numbers
- Sample Points
- Proposed Trenches

Geophysical  
Boundary

**AREE 26 Sampling Locations**

MAIN  
ENTRANCE

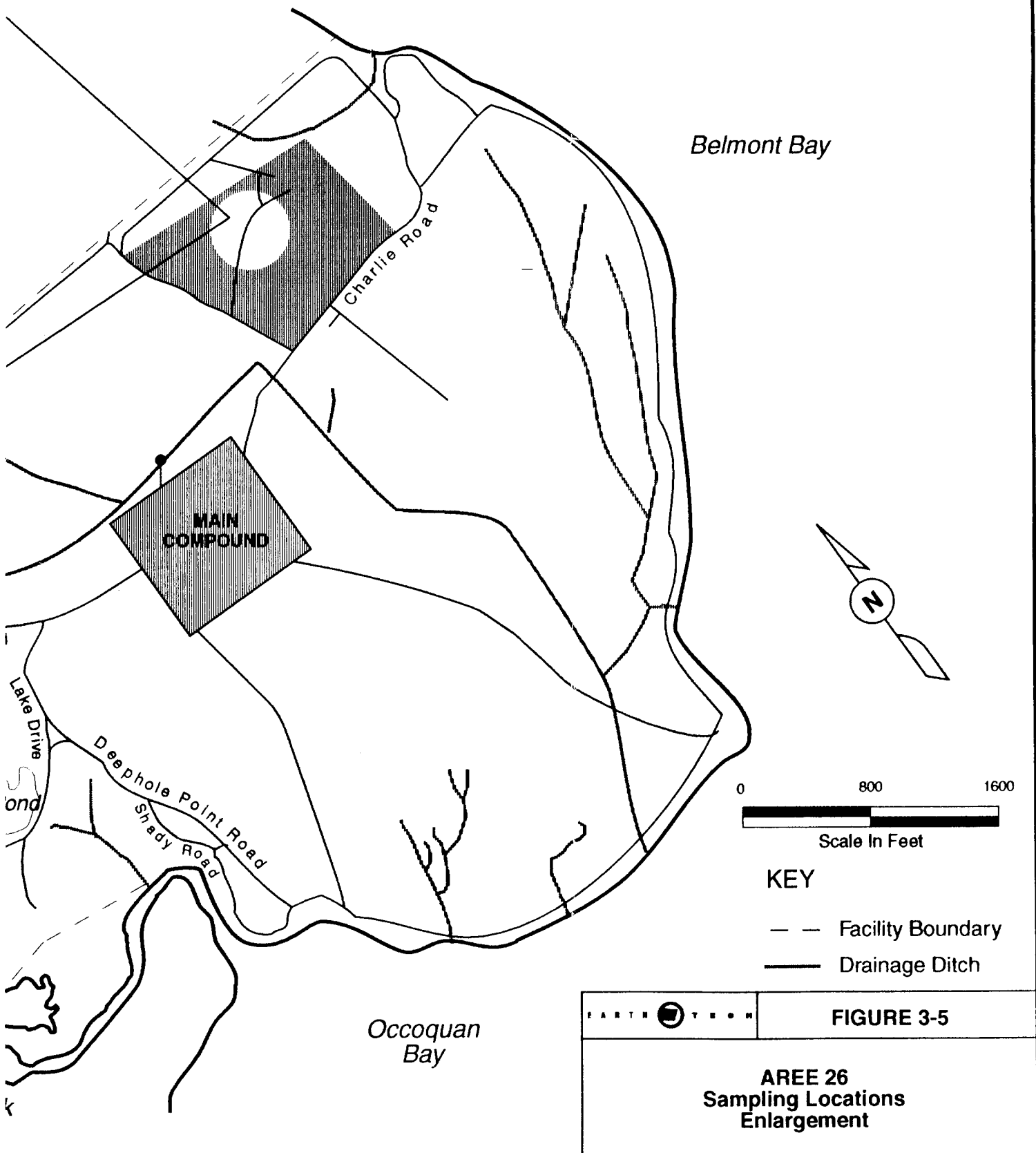
Dawson Beach Road

Lake Drive

Fond

Marumso

Creek



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# SECTION 4.0

## VADEQ RESPONSE ACTION FOR BUILDING 202

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**T**his section provides the site-specific information regarding the AREEs to be investigated as VADEQ Response Actions at Building 202. The VADEQ Response Action includes those AREEs (or portions thereof) described as former petroleum storage sites at WRF that are presently regulated under Article 9 of the State Water Control Law (VR 680-13-02). The AREEs (or portions thereof) included within this SCR for Building 202 are:

- ★ AREE 8 - UST Leaks/Spills (east of Building 202);
- ★ AREE 23 - Former USTs; and,
- ★ AREE 24 - Existing USTs.

A comprehensive presentation of site descriptions and histories, as well as methodologies, rationale and objectives to be used during the field investigation and analytical program is provided.

### 4.1 SITE DESCRIPTIONS AND HISTORY

**AREE 8 - UST LEAKS.** AREE 8 is located outside of the eastern wall of Building 202. There were three USTs of steel construction, each with a 10,000 gallon capacity that were installed at this location in 1966. There is anecdotal information concerning releases of petroleum products relating to overfilling the USTs or spills while filling these USTs in the past. In addition, water and oil reportedly seeps into the condensate return tank pit located in the electrical switch room in Building 202 (Weston, 1992).

AREE 8 was included in the initial SI field work completed by EARTH TECH in the Fall of 1993. Two composite surface soil samples were collected east of Building 202 along with an aqueous sample and an aqueous duplicate from the condensate return tank. TPHs were detected at concentrations of 14 ppm and 42 ppm in the composite surface soil samples and 2 ppm and 84 ppm in the aqueous and replicate samples, respectively.

**AREE 23 - FORMER USTs.** AREE 23 at Building 202 includes four former USTs whose locations, size, content and history are shown on Table 4-1. Below are descriptions of past UST-related removal actions and investigations at WRF. Figure 1-2 shows all UST locations at Building 202.

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**TABLE 4-1**  
**FORMER AND EXISTING UNDERGROUND STORAGE TANKS AT BUILDING 202**

Construction Material	Capacity (gallons)	Contents	Date Installed	Leak Tested	Results	Date Removed
Steel	10,000	Diesel	1966	No	--	1981
Steel	10,000	#2 Fuel Oil	1966	Yes	Failed	1990
Steel	10,000	#2 Fuel Oil	1966	Yes	Failed	1990
Steel	1,000	Gasoline	Unknown	Yes	Failed	1990
Fiberglass	2,000	Diesel	1981	Yes	Passed	Existing
Fiberglass	1,000	Gasoline	1990	Yes	Passed	Existing

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Four USTs have been removed and two USTs installed near Building 202. Three of the four former USTs were located just east of Building 202. These three USTs were of steel construction with steel piping and reportedly installed in 1966. Each had a 10,000-gallon capacity with one containing diesel fuel and two containing #2 Fuel Oil. In 1981, the 10,000-gallon diesel fuel tank was removed and replaced with a 2,000-gallon fiberglass UST buried just north of the original location. The two remaining 10,000-gallon #2 Fuel Oil tanks were removed in June 1990. TPHs were detected as part of the initial SI in two subsurface soil samples at 209 ppm and 302 ppm located east of Building 202 in the immediate area of the former USTs.

The fourth former UST near Building 202 was located just north of the building as shown in Figure 1-2. The tank was of steel construction and installed at an unknown time. The tank had a 1,000-gallon capacity and was used to contain gasoline. In June 1990, this UST was removed and replaced with a 1,000-gallon, fiberglass UST at the same location. Also installed at the same time as the new UST were two groundwater monitoring wells and spill/overflow protection. The two existing monitoring wells were sampled during the Preliminary SI completed by EARTH TECH in the Fall of 1993. A detection of TPH at 1 milligrams per liter (mg/L) was found in one well.

**AREE 24 - EXISTING USTs.** AREE 24 at Building 202 consists of the locations of two existing USTs. Both USTs passed tank and line tightness tests in October 1994. Below are descriptions of current USTs at Building 202, status, and past investigations at WRF.

The existing 2,000-gallon diesel UST at Building 202 is classified under the "existing UST system" based on its installation date occurring before December 22, 1988. The UST is currently in compliance with VADEQ. To meet compliance requirements the UST is required to receive annual tank tightness testing until December 22, 1998. Also, the piping lines must be tightness tested every 3 years or receive monthly monitoring. The Preliminary SI completed by EARTH TECH in the Fall of 1993 revealed a detection of TPH in two soil samples at 209 ppm and 302 ppm. These soil samples were located approximately 10 feet south of the UST and in the immediate location of one of the former 10,000-gallon USTs (AREE 23) which may have been the source of the elevated TPH concentrations.

The existing 1,000-gallon gasoline UST at Building 202 is regulated under current UST requirements due to its installation after December 22, 1988. Spill and overfill protection and two groundwater monitoring wells were also installed at the time of the new tank installation. The UST is currently in compliance with VADEQ. The WRF submits monthly inventory control and 5-year tank tightness testing for the UST.

## **4.2 EXTENT OF CONTAMINATION**

The extent of TPH contamination is not defined at AREEs 8 (UST leaks), 23 (former USTs) and AREE 24 (existing USTs). Soil and groundwater samples analyzed for TPH



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as part of the SI reported that the overflow/spill area at AREE 8 had TPH concentrations at 14 and 42 ppm. Soil samples in the immediate area of former and existing USTs at Building 202 had TPH concentrations at 209 and 302 ppm. Groundwater samples from two existing wells at AREE 23 contained no significant TPH contamination.

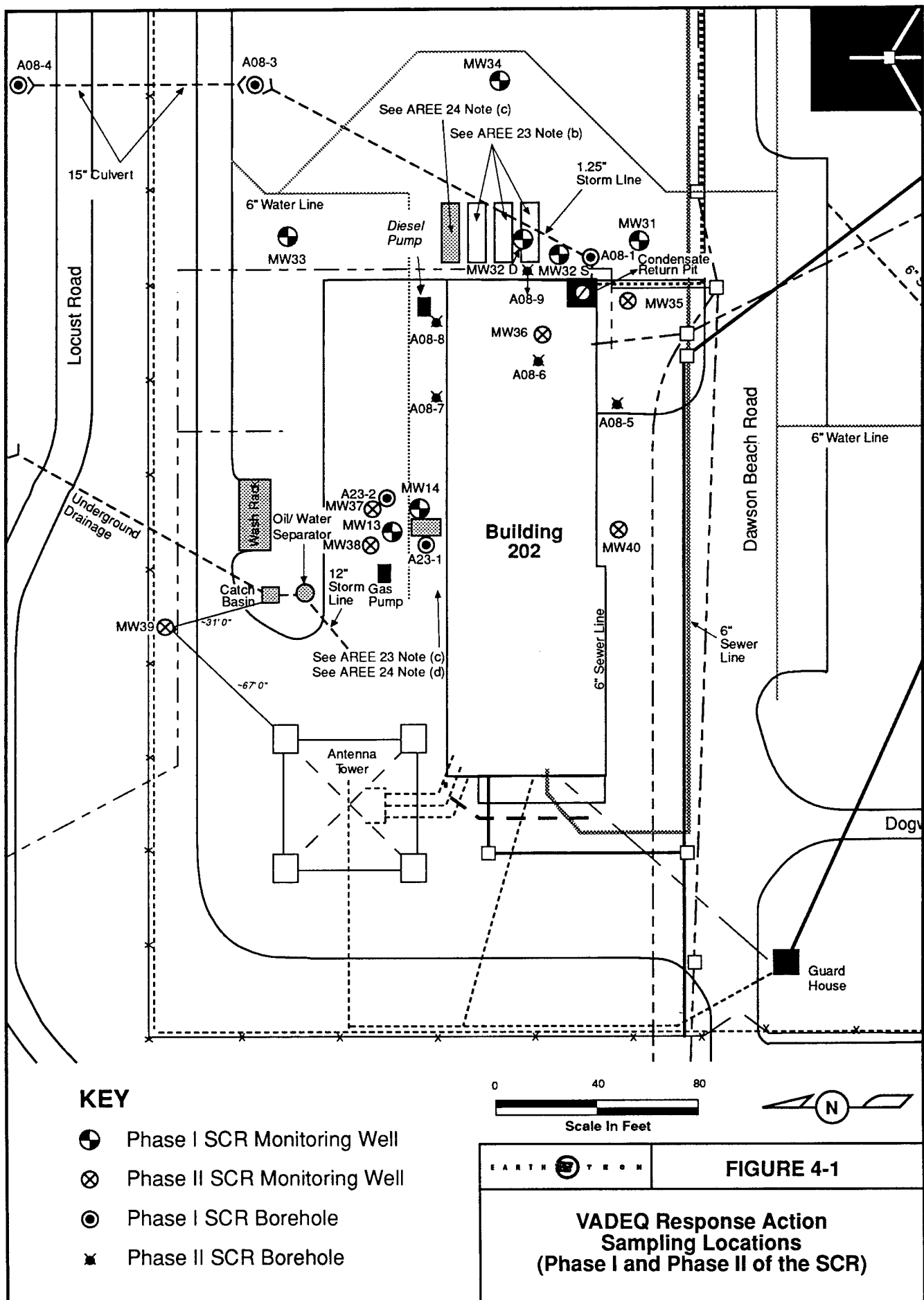
#### **4.3 PROPOSED SAMPLING ACTIVITIES AND ANALYSES FOR PHASE I OF THE SCR**

The VADEQ Response Action is to include the following activities at the UST-related AREEs. At the location of the three former USTs just east of Building 202, five monitoring wells will be installed as illustrated on Figure 4-1. During the drilling of the boreholes for the wells, soil samples will be collected at 2-foot intervals for lithologic characterization. Five soil samples (one from each borehole) will be collected and analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), TPH, PCBs, and lead. The samples for chemical analysis will be collected at a depth below the former USTs or at the top of groundwater. These boreholes will extend approximately 7 feet into the saturated soil at which depth the monitoring wells will be constructed. Upon completion of well construction and development, a groundwater sample from each newly installed well will be collected and analyzed for TPH, BTEX, and lead.

The drainage area possibly impacted by spills related to filling the former and existing USTs just east of Building 202 and the discharge from the condensate return tank pit will also be investigated. Soil samples will be collected via soil borings at the end sections of the drainage pipes in the area in question as shown on Figure 4-1. Six soil samples (two per boring) will be collected and analyzed for TPH, BTEX, PCBs, and lead. The maximum depth of these borings will be approximately 4 feet.

The condensate return tank pit will also be investigated to characterize any contamination present in the pit as well as the source of the reported petroleum that seeps into the pit. One aqueous sample will be collected from the pit and analyzed for TPH, BTEX, and lead.

The existing gasoline UST located just north of Building 202 which replaced the former gasoline UST at the same location will also be investigated. Groundwater samples will be collected from the two existing monitoring wells (MW13, MW14) installed for the existing UST. The groundwater samples will be analyzed for TPH, BTEX, and lead. In addition, two soil borings (A23-1, A23-2) will be installed at the approximate locations illustrated in Figure 4-1. During drilling of the borings, soil samples will be collected at 2-foot intervals for lithologic characterization. Four soil samples (two per boring) will be collected and analyzed for TPH, BTEX, PCBs, and lead. The samples for chemical analysis will be collected at a depth below the former UST and at the top of groundwater.



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No intrusive sampling is required for the existing USTs. This is due to the USTs passing their tightness tests in October 1994. Copies of the testing results will be necessary to complete the required SCR for the VADEQ Response Action.

#### **4.4 ADDITIONAL PROPOSED SAMPLING ACTIVITIES AND ANALYSES (PHASE II SCR)**

Five additional boreholes (A08-5 through A08-9) and six additional monitoring wells (MW35 through MW40) are proposed to collect additional soil and groundwater samples to define the extent of contamination at tank-related AREEs 8, 23, and 24. The proposed monitoring wells and boreholes are depicted on Figure 4-1.

MW35 is to be located just south of Building 202 as near to the building as practical and as close to the southeast corner of the building as possible. As shown on the figure, many utilities are located in this same area with a large tree also being located in this vicinity. These obstructions may hinder the ability to install this well in a location just outside the building where the sump pump (condensate return tank pit) is located.

MW36 is to be located within Building 202 as near to the condensate return tank pit as practical. During past field efforts, electrical equipment was noted in the immediate vicinity of the condensate return tank pit with access to the equipment and pit being controlled via a locking fence. Therefore, this electrical equipment may hinder the ability to install this well in the vicinity of the condensate return tank pit as requested. Monitoring wells MW37, MW38, and MW39 are to be installed downgradient of the tank location north of Building 202 as depicted on Figure 4-1. Monitoring well MW40 is to be located as an upgradient well, south of Building 202.

Boreholes A08-5 through A08-9 will be installed to further determine the extent of the soil contamination at Building 202. Borehole A08-5 is to be located on the south side of the building. Borehole A08-6 is to be located inside Building 202. Two boreholes, A08-7 and A08-8, will be located on the north side of the building as close to the building as possible. The last borehole, A08-9, will be located on the east side of Building 202 between MW32D and the building.

For the sampling locations within Building 202, a concrete corer will be used to penetrate the concrete floor. During the drilling or hand augering of the boreholes, soil samples will be collected at 2-foot intervals for lithologic characterization. All sampling procedures described in the TSAP (EARTH TECH, February 1995) will be followed. Five soil samples (one from each borehole) will be collected and analyzed for TPH, VOCs, base/neutral acids (BNAs), PCBs/pesticides, and metals. The samples for chemical analysis will be collected at the soil/groundwater interface. Twelve soil samples (two from each borehole) will be collected from monitoring well boreholes at the 4- to 6-foot interval below ground surface (bgs) and at the soil/groundwater interface. The soil samples will be analyzed for TPH, VOCs, BNAs, PCBs/pesticides, and metals. For those borings being converted to monitoring wells, the boreholes will be extended approximately 7 feet into the saturated soil at which depth the

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monitoring wells will be constructed. Upon completion of well construction and development, a groundwater sample from each newly installed well will be collected and analyzed for TPH, VOCs, BNAs, PCBs/pesticides, and metals (filtered).

A 1,000-gallon UST located on the north side of Building 202 was replaced in 1990 with the existing 1,000-gallon UST. The two existing wells (MW13 and MW14) located by this UST were not installed according to USAEC guidance. These two wells are proposed for abandonment.

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# SECTION 5.0

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EARTH TECH, March 1994. Final Work Plan for Woodbridge Research Facility.

EARTH TECH, 1995. Site Inspection Report, Woodbridge Research Facility.

EARTH TECH, 1995. Draft Technical Sampling and Analysis Plan.

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# **A P P E N D I X   A**

## **IRDMIS MAP FILE**



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F_SITE_TYPE	F_SITE_ID	F_X_COOR	F_Y_COOR	F_SYSTEM	F_ACCSRC	F_ACCEXPO	F_ELEV
BORE	A07-1	305005	4279005	U	M	9	0.0
BORE	A07-2	305005	4278980	U	M	9	0.0
BORE	A07-3	304995	4278980	U	M	9	0.0
BORE	A07-4	304995	4279005	U	M	9	0.0
BORE	A12-1	305275	4279640	U	M	9	0.0
BORE	A12-2	305280	4279640	U	M	9	0.0
BORE	A12-3	305275	4279660	U	M	9	0.0
BORE	A12-4	305280	4279660	U	M	9	0.0
BORE	A13-1	305428	4279573	U	M	9	0.0
BORE	A13-2	305432	4279573	U	M	9	0.0
BORE	A13-3	305428	4279578	U	M	9	0.0
BORE	A21-1	305480	4279560	U	M	9	0.0
BORE	A21-2	305490	4279560	U	M	9	0.0
BORE	A21-3	305480	4279570	U	M	9	0.0
BORE	A21-4	305490	4279570	U	M	9	0.0
BORE	A6B-1	305015	4279005	U	M	9	0.0
EXCV	A26-1	305775	4279870	U	M	9	0.0
EXCV	A26-2	305850	4279871	U	M	9	0.0
EXCV	A26-3	305910	4279872	U	M	9	0.0
GRAB	A25-10	304650	4279590	U	M	9	0.0
GRAB	A25-11	305280	4280020	U	M	9	0.0
GRAB	A25-12	305460	4280035	U	M	9	0.0
GRAB	A25-13	305270	4280080	U	M	9	0.0
GRAB	A25-14	305450	4280090	U	M	9	0.0
GRAB	A25-15	306170	4279650	U	M	9	0.0
GRAB	A25-16	306210	4279650	U	M	9	0.0
GRAB	A25-17	306170	4279790	U	M	9	0.0
GRAB	A25-18	306250	4279790	U	M	9	0.0
GRAB	A25-7	304580	4279385	U	M	9	0.0
GRAB	A25-8	304650	4279385	U	M	9	0.0
GRAB	A25-9	304575	4279590	U	M	9	0.0
JTSL	A18-1	305240	4279515	U	M	9	0.0
VADEQ RESPONSE ACTION							
WELL	MW-31	305315	4279600	U	M	9	0.0
WELL	MW-32	305315	4279625	U	M	9	0.0
WELL	MW-33	305315	4279650	U	M	9	0.0
WELL	MW-34	305330	4279625	U	M	9	0.0
BORE	A08-1	305310	4279610	U	M	9	0.0
BORE	A08-3	305330	4279660	U	M	9	0.0
BORE	A08-4	305330	4279685	U	M	9	0.0
BORE	A23-1	305260	4279645	U	M	9	0.0
BORE	A23-2	305270	4279650	U	M	9	0.0
BORE	MW-31	305315	4279600	U	M	9	0.0
BORE	MW-32	305315	4279625	U	M	9	0.0
BORE	MW-33	305315	4279650	U	M	9	0.0
BORE	MW-34	305330	4279625	U	M	9	0.0
BORE	MW-35	305300	4279600	U	M	9	0.0
BORE	MW-36	305300	4279615	U	M	9	0.0
BORE	MW-37	305275	4279635	U	M	9	0.0
BORE	MW-38	305260	4279640	U	M	9	0.0
BORE	MW-39	305260	4279670	U	M	9	0.0
BORE	MW-40	305260	4279600	U	M	9	0.0
BORE	MW-35	305300	4279600	U	M	9	0.0
WELL	MW-36	305300	4279615	U	M	9	0.0
WELL	MW-37	305275	4279635	U	M	9	0.0
WELL	MW-38	305260	4279640	U	M	9	0.0
WELL	MW-39	305260	4279670	U	M	9	0.0
WELL	MW-40	305260	4279600	U	M	9	0.0
BORE	A08-5	305295	4279600	U	M	9	0.0
BORE	A08-6	305295	4279615	U	M	9	0.0
BORE	A08-7	305295	4279635	U	M	9	0.0
BORE	A08-8	305300	4279635	U	M	9	0.0
BORE	A08-9	305310	4279620	U	M	9	0.0

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